SPECIFICATIONS
100% CONSTRUCTION DOCUMENTS

114 E. MAIN PLAZA

San Antonio, Texas

February 15, 2019

Fpc #96300

FORD POWELL &CARSON Architects & Planners, Inc.

Architecture
Planning
Interior Design
Preservation

1138 E. Commerce Street
San Antonio, TX 78205
210.226.1246 I 210.226.6482
fpcarch.com

SECTION 00 0101

PROJECT TITLE PAGE AND CERTIFICATIONS

ARCHITECT: FORD, POWELL & CARSON ARCHITECTS & PLANNERS, INC.
PRINCIPAL: RACHEL L.H. WRIGHT, AIA, LEED GA
1138 EAST COMMERCE STREET
SAN ANTONIO, TEXAS 78205
(210) 226-1246 OFFICE
(210) 226-6482 FAX

STRUCTURAL ENGINEER: DATUM ENGINEERS, INC.
TIM STOCKS, PE
5021 BROADWAY
SAN ANTONIO, TEXAS 78209
(210) 858-2880 OFFICE

MEP ENGINEER: CLEARY ZIMMERMANN ENGINEERS, LLC
THOMAS WATSON, PE LEED GA
1344 S. FLORES, SUITE 200
SAN ANTONIO, TEXAS 78204
(210) 447-6100 OFFICE
(210) 447-6101 FAX

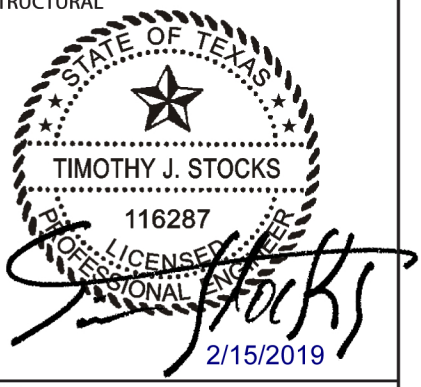
CIVIL ENGINEER: GARZA EMC
JULIA L. MRNAK, P.E.
7708 RIALTO BLVD. STE 125
AUSTIN, TEXAS 78735
(512) 298 - 3284 x 106 OFFICE
(512) 298 - 2561 FAX

BUILDING CODE: FIRE PROTECTION CONSULTING GROUP, LLC
TEMPLE R. KENNEDY, CBCO, CFCO
339 SANDLEWOOD LANE
SAN ANTONIO, TX
(210) 858-2389 OFFICE

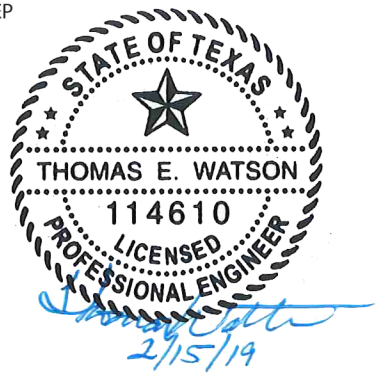
END OF PROJECT TITLE PAGE

ARCHITECTUAL

STRUCTURAL



MEP



CIVIL

SECTION 00 0102

PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: 114 Main Plaza Renovation, located at 114 Main Plaza, San Antonio, TX 78205.

B. Project Number: FPC# 96300.

C. The Owner, hereinafter referred to as Owner: Lisa Wong.
910 S. Alamo St.
San Antonio, Texas 78205

1.02 PROJECT DESCRIPTION

A. Summary Project Description:
1. Renovation of historic buildings for use as future retail space on the first floor, storage in the basement, and two rental apartments on the second level. To qualify for historic tax credits, the renovation will adhere to the Secretary of Interior's Standards for Rehabilitation.
2. Renovation of the exterior envelope as neccessary including modifications to remove non historic elements.
3. Installation of new balconies and roof top terrace.
4. First Floor and Basement will be a shell space for future tenant finish out.
5. Two apartments on the second floor, will include new stairs and elevator.

1.03 PROJECT CONSULTANTS

A. The Architect, hereinafter referred to as Architect: Ford, Powell & Carson, Architects and Planners, Inc. .
1. Address: 1138 E Commerce.
2. City, State, Zip: San Antonio, TX 78205.
3. Phone/Fax: 210.226.1246.

1.04 PROCUREMENT TIMETABLE

A. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.05 PROCUREMENT DOCUMENTS

A. Availability of Documents: Complete sets of procurement documents may be obtained:
1. In PDF form: from Architect upon request at jkreusel@fpcarch.com
2. Printed sets upon request from Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 0110

TABLE OF CONTENTS

END OF SECTION

SECTION 00 2113
INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 SEE AIA A701, INSTRUCTIONS TO BIDDERS FOLLOWING THIS DOCUMENT.

1.02 RELATED DOCUMENTS

A. Document 01 1000 - Summary.

B. Document 00 4100 - Bid Form.

C. Document 00 4323 - Alternates Form.

D. Document 00 4325 - Substitution Request Form - During Procurement

INVITATION

2.01 BID SUBMISSION

A. Bids signed and under seal, executed, and dated will be received at the office of the Architect at 1138 E. Commerce Street, San Antonio, Texas 78205 before 2:00 p.m. local standard time on the 15 day of March, 2019.

B.

2.02 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises building construction, including general construction Work.

B. Location: Project Site located at 114 Main Plaza, San Antonio, Texas 78205.

2.03 CONTRACT TIME

A. Identify Contract Time in the Bid Form. The completion date in the Agreement shall be the Contract Time added to the commencement date.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

A. Bid Documents: Contract Documents supplemented with Instructions to Bidders, Bid Form Supplements To Bid Forms and Appendices identified.

B. Contract Documents: Defined in AIA 104-2017 including issued Addenda.

C. Bid, Offer, or Bidding: Act of submitting an offer under seal.

D. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

3.02 AVAILABILITY

A. Bid Documents can be obtained electronically from Architect by invited general contract bidders free of charge. All mailing, reproduction and delivery of Bid Documents is the sole responsibility of the contractor.

B. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

3.03 EXAMINATION

A. Bid documents will be submitted electronically to invited bidders.

B. Upon receipt of Bid Documents verify that documents are complete. Notify Architect should the documents be incomplete.

C. Immediately notify Architect upon finding discrepancies or omissions in the Bid Documents.

3.04 INQUIRIES/ADDENDA

A. Direct questions to Jeremy Kreusel, email; jkreusel@fpcarch.com.

B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.

C. Verbal answers are not binding on any party.

D. Clarifications requested by bidders must be in writing received by the architect not less than 8 business days before date set for receipt of bids (March 6, 2019). The reply will be in the form of an Addendum, a copy of which will be forwarded to invited bidders.

3.05 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 10 days before receipt of bids.

B. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to invited bidders.

C. The submission shall provide sufficient information to determine acceptability of such products.

D. Provide complete information on required revisions to other work to accommodate each proposed substitution.

E. Provide products as specified unless substitutions are submitted in this manner and accepted.

SITE ASSESSMENT

4.01 SITE EXAMINATION

A. The bidder is required to contact Architect at the following address and phone number in order to arrange a date and time to visit the project site: beyond the prebid conference..
   1. Email: jkreusel@fpcarch.com
   2. Phone: 210.226.1246

4.02 PREBID CONFERENCE

A. A bidders conference has been scheduled for 10:00 a.m. on the 27 day of March 2019 at the location of 114 Main Plaza, San Antonio, TX 78205.

B. All general contract bidders and suppliers are invited.

C. Representatives of Architect will be in attendance.

D. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

BID SUBMISSION

5.01 SUBMISSION PROCEDURE

A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.

B. Submit two copies of the executed offer on the Bid Forms provided, signed and sealed in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.
   1. Provide two copies of the list of subcontractors on the form included with bid documents in a separate sealed envelope with the title "List of Subcontractors" lettered outside.

5.02 BID INELIGIBILITY

A. Bids are by invitation, only from selected bidders. Bids from unsolicited bidders may be returned.

BID ENCLOSURES/REQUIREMENTS

6.01 PERFORMANCE ASSURANCE

A. Accepted Bidder: Provide a Performance Bond as Defined in [AIA 701-2017]

B. Accepted Bidder: Provide a Payment Bond as Defined in [AIA 701-2017]

OFFER ACCEPTANCE/REJECTION

7.01 ACCEPTANCE OF OFFER

A. Owner reserves the right to accept or reject any or all offers.

END OF SECTION

DRAFT

AIA® Document A701™ – 2018

Instructions to Bidders

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

« »
« »
« »

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

« »« »
« »
« »
« »

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

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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.)

« »

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

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

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

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

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

§ 3.2 Modification or Interpretation of Bidding Documents

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

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

« »

§ 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.

§ 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.)

« »

§ 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.)

« »

§ 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.)

« »

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

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

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

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

§ 4.4 Modification or Withdrawal of Bid

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

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

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

(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

« »

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

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

§ 5.2 Rejection of Bids

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

§ 5.3 Acceptance of Bid (Award)

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

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

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

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

§ 6.2 Owner's Financial Capability

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

§ 6.3 Submittals

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

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

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

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

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

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

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

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

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

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

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

« »

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

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

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

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

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS
§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

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

« »

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

« »

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

« »

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

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

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

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

« »

[« »] The Sustainability Plan:

Title	Date	Pages

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

Document	Title	Date	Pages

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

« »

SECTION 00 3100

AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents, as follows:
   1. Abatement Completion Report, dated November 28, 2017.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 4100

BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Owner

Lisa Wong
910 S. Alamo St.
San Antonio, Tx 78205

1.02 FOR:

A. Architects Project Number: 96300

114 Main Plaza
San Antonio, Tx 78205

1.03 DATE: _____

1.04 SUBMITTED BY:

A. Bidder's Full Name _____
   1. Address _____
   2. City, State, Zip_____

1.05 OFFER

A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Bid Documents prepared by FPC for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

B. _____
_____ dollars
($_____).

C. We have included the required performance assurance bonds in the Bid Amount as required by the Instructions to Bidders.

D. All applicable federal taxes are included and State of Texas taxes are included in the Bid Sum.

1.06 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for thirty days from the bid closing date.

B. If this bid is accepted by Owner within the time period stated above, we will:
   1. Execute the Agreement within seven days of receipt of Notice of Award.
   2. Furnish the required bonds within seven days of receipt of Notice of Award.
   3. Commence work within seven days after written Notice to Proceed of this bid.

1.07 CONTRACT TIME

A. If this Bid is accepted, we will:

B. Complete the Work in _____ calendar days from Notice to Proceed.

1.08 CHANGES TO THE WORK

A. When Architect establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:
   1. _____ percent overhead and profit on the net cost of our own Work;
   2. _____ percent on the cost of work done by any Subcontractor.

B. On work deleted from the Contract, our credit to Owner shall be Architect-approved net cost plus _____ of the overhead and profit percentage noted above.

1.09 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.

1.10 BID FORM SUPPLEMENTS

A. The following information is included with Bid submission:

B. The following Supplements are attached to this Bid Form and are considered an integral part of this Bid Form:
   1. Document 00 4323 - Alternates Form: Include the cost variations to the Bid Sum applicable to the Work as described in Section 00 4323.
   2. Document 00 4325 - Substitution Request Form - During Procurement.

1.11 BID FORM SIGNATURE(S)

A. (Bidder - print the full name of your firm)

_____

B. was hereunto affixed in the presence of:

_____

C. (Authorized signing officer, Title)

_____

D. (Seal)

END OF SECTION

SECTION 00 4323

ALTERNATES FORM

PARTICULARS

1.01 THE FOLLOWING IS THE LIST OF ALTERNATES REFERENCED IN THE BID SUBMITTED BY:

1.02 (BIDDER) _____

1.03 TO (OWNER): _____

1.04 DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

ALTERNATES LIST

2.01 THE FOLLOWING AMOUNTS SHALL BE ADDED TO OR DEDUCTED FROM THE BID AMOUNT. REFER TO SECTION 01 2300 - ALTERNATES.

ALTERNATE # 1: ADD / (DEDUCT) $ _____

END OF SECTION

SECTION 00 4325

SUBSTITUTION REQUEST FORM - DURING PROCUREMENT

IDENTIFICATION:

OWNER: LISA WONG

DESIGN PROFESSIONAL: FORD, POWELL & CARSON, INC.

1138 E. COMMERCE STREET , SAN ANTONIO, TEXAS 78205

PROJECT NAME: 114 MAIN PLAZA RENOVATION

PROJECT NUMBER: 96300 DATE:_____

REFERENCE:

SPECIFICATION TITLE:_____

SPECIFICATION NO.: _____ PAGE: _____ ARTICLE/PARAGRAPH _____

DESCRIPTION:

MANUFACTURER'S NAME: _____ MODEL NO: _____

TRADE NAME: _____

PROPOSED SUBSTITUTION GENERAL DESCRIPTION:_____

_____

_____

ATTACHMENTS INCLUDE PRODUCT DESCRIPTION, SPECIFICATIONS, DRAWINGS, PHOTOGRAPHS, PERFORMANCE DATA, AND TEST DATA ADEQUATE FOR EVALUATION OF THE REQUEST AS IT COMPARES TO THE SPECIFIED ITEM.

APPLICABLE PORTIONS ARE CLEARLY IDENTIFIED.

ATTACHED DATA ALSO INCLUDES DESCRIPTION OF CHANGES TO THE CONTRACT DOCUMENTS WHICH WILL BE REQUIRED FOR PROPER INSTALLATION OF THE PROPOSED SUBSTITUTION.

CERTIFICATION:

THE UNDERSIGNED STATES THAT THE FOLLOWING STATEMENTS, UNLESS INDICATED TO THE CONTRARY BELOW, ARE CORRECT:

- **PROPOSED SUBSTITUTION HAD BEEN INVESTIGATED AND DETERMINED THAT IT MEETS OR EXCEEDS THE QUALITY LEVEL OF THE SPECIFIED PRODUCT.**
- **THE PROPOSED SUBSTITUTION DOES NOT MATERIALLY AFFECT DIMENSIONS GIVEN IN THE CONTRACT DOCUMENTS.**
- **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, THE CONSTRUCTION SCHEDULE, OR SPECIFIED WARRANTY/GUARANTEE REQUIREMENTS AND MEETS ALL APPLICABLE CODE REQUIREMENTS.**
- **THE UNDERSIGNED WILL PAY FOR REQUIRED CHANGES TO THE PROJECT DESIGN, INCLUDING ARCHITECTURAL AND ENGINEERING DESIGN, DETAILING, CONSTRUCTION COST, AND ALL OTHER ADDITIONAL EXPENSES CAUSED BY THE**

SUBSTITUTION.

- **MAINTENANCE AND SERVICE PARTS FOR THE SUBSTITUTION WILL BE LOCALLY AVAILABLE.**

THE UNDERSIGNED CERTIFIES THAT THE FUNCTION, APPEARANCE, AND QUALITY OF THE PROPOSED SUBSTITUTION ARE EQUAL OR SUPERIOR TO THE SPECIFIED ITEM, THAT THE PROPOSED SUBSTITUTION WILL RESULT IN WORK THAT IN EVERY SIGNIFICANT RESPECT IS EQUAL OR BETTER THAN THE WORK REQUIRED BY THE CONTRACT DOCUMENTS, AND THAT THE PROPOSED SUBSTITUTION IS SUITABLE FIR THE INTENDED PURPOSE ON THIS PROJECT.

THE PROPOSED SUBSTITUTION WILL RESULT IN A COST SAVINGS TO THE OWNER IN THE AMOUNT OF $_____DOLLARS.

THE PROPOSED SUBSTITUTION WILL RESULT IN A TIME SAVINGS TO THE OWNER IN THE AMOUNT OF $_____DOLLARS.

SUBMITTED AND SIGNED BY: (CONTRACTOR)

_____

NAME TITLE

FIRM: _____

ADDRESS: _____

TELEPHONE:_____

ATTACHED SUPPORTING DATA:

[_] DRAWINGS [_] PRODUCT DATA [_] SAMPLES [_] TESTS [_] REPORTS [_] _____

A/E'S REVIEW AND ACTION:

[_] SUBSTITUTION APPROVED - MAKE SUBMITTALS IN ACCORDANCE WITH SPECIFICATIONS SECTION 01 2500.

[_] SUBSTITUTION APPROVED AS NOTED - MAKE SUBMITTALS IN ACCORDANCE WITH SECTION 01 2500.

[_] SUBSTITUTION REJECTED - USE SPECIFIED MATERIALS.

[_] SUBSTITUTION REQUEST RECEIVED TOO LATE - USE SPECIFIED MATERIAL.

SIGNED BY: (FORD, POWELL & CARSON, INC.)

_____

NAME TITLE DATE

FOR OWNER USE: REVIEW AND ACTION:

[_] SUBSTITUTION APPROVED

[_] SUBSTITUTION APPROVED AS NOTED

[_] SUBSTITUTION REJECTED - USE SPECIFIED MATERIALS.

SIGNED BY: (OWNER)

NAME	TITLE	DATE

END OF SECTION

SECTION 00 4373

PROPOSED SCHEDULE OF VALUES FORM

PARTICULARS

1.01 THE FOLLOWING IS A COST BREAKDOWN REFERENCED IN THE BID SUBMITTED BY:

1.02 (BIDDER) _____

1.03 DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

ITEM DESCRIPTIONS

2.01 SCHEDULE OF VALUES

Contractor shall submit to ODR and A/E for acceptance a Schedule of Values accurately itemizing material and labor for the various classifications of the Work based on the organization of the specification sections and of sufficient detail acceptable to ODR. The accepted Schedule of Values will be the basis for the progress payments under the contract.

2.02 SCHEDULE OF VALUES TO BE ATTACHED:

END OF SECTION

SECTION 00 5000

CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. The Agreement and General Conditions are based on AIA A104-2017.

1.02 REFERENCE STANDARDS

A. AIA A104 - Standard Abbreviated Form of Agreement Between Owner and Contractor; 2017.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

DRAFT

AIA® Document A104™ – 2017

Standard Abbreviated Form of Agreement Between Owner and Contractor

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

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

« »« »
« »
« »
« »

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

« »« »
« »
« »
« »

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

« »
« »
« »

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

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

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.

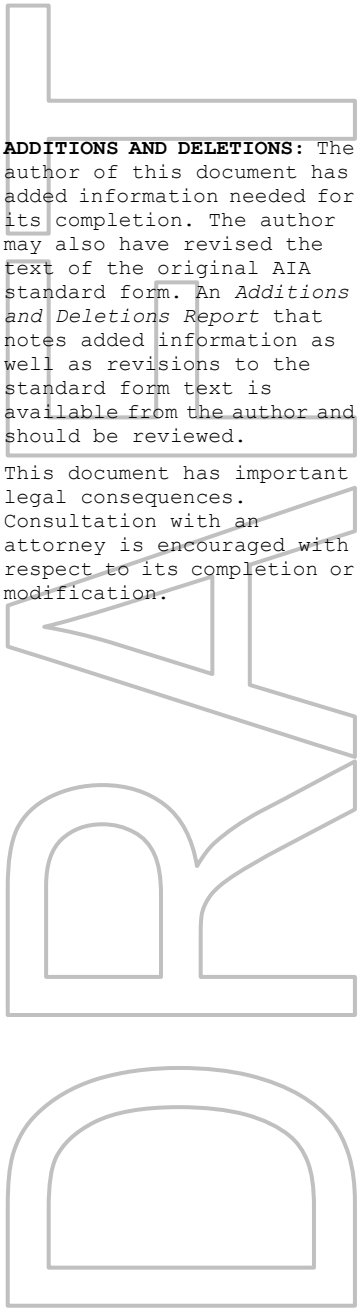

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TABLE OF ARTICLES

ARTICLE 1 THE WORK OF THIS CONTRACT

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

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

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

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

§ 2.3 Substantial Completion

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

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

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

Portion of Work	Substantial Completion Date

§ 2.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 2.3, liquidated damages, if any, shall be assessed as set forth in Section 3.5.

ARTICLE 3 CONTRACT SUM

§ 3.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[« »] Stipulated Sum, in accordance with Section 3.2 below

[« »] Cost of the Work plus the Contractor's Fee, in accordance with Section 3.3 below

[« »] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 3.4 below

(Based on the selection above, complete Section 3.2, 3.3 or 3.4 below.)

§ 3.2 The Stipulated Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 3.2.1 The Stipulated Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

« »

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 3.2.3 Allowances, if any, included in the stipulated sum:
(Identify each allowance.)

Item	Price

§ 3.3 Cost of the Work Plus Contractor's Fee
§ 3.3.1 The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

§ 3.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)

« »

§ 3.4 Cost of the Work Plus Contractor's Fee With a Guaranteed Maximum Price
§ 3.4.1 The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

§ 3.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)

« »

§ 3.4.3 Guaranteed Maximum Price
§ 3.4.3.1 The sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed « » ($ « »), subject to additions and deductions by changes in the Work as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.
(Insert specific provisions if the Contractor is to participate in any savings.)

« »

§ 3.4.3.2 The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

« »

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 3.4.3.4 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 3.4.3.5 Assumptions, if any, on which the Guaranteed Maximum Price is based:

« »

§ 3.4.3.6 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes or equipment, all of which, if required, shall be incorporated by Change Order.

§ 3.4.3.7 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 3.4.3.5. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 3.4.3.5 and the revised Contract Documents.

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

« »

ARTICLE 4 PAYMENT

§ 4.1 Progress Payments

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

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

« »

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

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

« »

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

« » % « »

§ 4.2 Final Payment

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 18.2, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, where payment is on the basis of the Cost of the Work with or without a Guaranteed Maximum Price; and

.3 a final Certificate for Payment has been issued by the Architect in accordance with Section 15.7.1.

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

« »

ARTICLE 5 DISPUTE RESOLUTION

§ 5.1 Binding Dispute Resolution

For any claim subject to, but not resolved by, mediation pursuant to Section 21.5, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 21.6 of this Agreement

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

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

ARTICLE 6 ENUMERATION OF CONTRACT DOCUMENTS

§ 6.1 The Contract Documents are defined in Article 7 and, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 6.1.1 The Agreement is this executed AIA Document A104™–2017, Standard Abbreviated Form of Agreement Between Owner and Contractor.

§ 6.1.2 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203–2013 incorporated into this Agreement.)

« »

§ 6.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

§ 6.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

« »

Section	Title	Date	Pages

§ 6.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

« »

Number	Title	Date

§ 6.1.6 The Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are enumerated in this Article 6.

§ 6.1.7 Additional documents, if any, forming part of the Contract Documents:

.1 Other Exhibits:
(Check all boxes that apply.)

[« »] Exhibit A, Determination of the Cost of the Work.

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

« »

[« »] The Sustainability Plan:

Title	Date	Pages

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

Document	Title	Date	Pages

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

« »

ARTICLE 7 GENERAL PROVISIONS

§ 7.1 The Contract Documents

The Contract Documents are enumerated in Article 6 and consist of this Agreement (including, if applicable, Supplementary and other Conditions of the Contract), Drawings, Specifications, Addenda issued prior to the execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement. 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. 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 to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 7.2 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 between any persons or entities other than the Owner and the Contractor.

§ 7.3 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.

§ 7.4 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.

§ 7.5 Ownership and use of Drawings, Specifications and Other Instruments of Service

§ 7.5.1 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 will 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.

§ 7.5.2 The Contractor, Subcontractors, Sub-subcontractors and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to the protocols established pursuant to Sections 7.6 and 7.7, 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 this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 7.6 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.

§ 7.7 Building Information Models Use and Reliance

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

§ 7.8 Severability

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.

§ 7.9 Notice

§ 7.9.1 Except as otherwise provided in Section 7.9.2, 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 in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

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

« »

§ 7.9.2 Notice of Claims 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.

§ 7.10 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

ARTICLE 8 OWNER

§ 8.1 Information and Services Required of the Owner

§ 8.1.1 Prior to commencement of the Work, at the 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 8.1.1, the Contract Time shall be extended appropriately.

§ 8.1.2 The Owner shall furnish all necessary surveys and a legal description of the site.

§ 8.1.3 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.

§ 8.1.4 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 9.6.1, the Owner shall secure and pay for other necessary approvals, easements, assessments, and charges required for the construction, use, or occupancy of permanent structures or for permanent changes in existing facilities.

§ 8.2 Owner's Right to Stop the Work

If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents, or repeatedly fails to carry out the 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 is 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.

§ 8.3 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 any 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 15.4.3, 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 the Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. 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 21.

ARTICLE 9 CONTRACTOR

§ 9.1 Review of Contract Documents and Field Conditions by Contractor

§ 9.1.1 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.

§ 9.1.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 8.1.2, 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.

§ 9.1.3 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.

§ 9.2 Supervision and Construction Procedures

§ 9.2.1 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, unless the Contract Documents give other specific instructions concerning these matters.

§ 9.2.2 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.

§ 9.3 Labor and Materials

§ 9.3.1 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.

§ 9.3.2 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 skilled in tasks assigned to them.

§ 9.3.3 The Contractor may make a substitution only with the consent of the Owner, after evaluation by the Architect and in accordance with a Modification.

§ 9.4 Warranty

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 under normal usage. All other 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 15.6.3.

§ 9.5 Taxes

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

§ 9.6 Permits, Fees, Notices, and Compliance with Laws

§ 9.6.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as 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.

§ 9.6.2 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. 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.

§ 9.7 Allowances

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. The Owner shall select materials and equipment under allowances with reasonable promptness. Allowance amounts shall include the costs to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts. Contractor's costs for unloading and handling at the site, labor, installation, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowance.

§ 9.8 Contractor's Construction Schedules

§ 9.8.1 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 not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 9.8.2 The Contractor shall perform the Work in general accordance with the most recent schedule submitted to the Owner and Architect.

§ 9.9 Submittals

§ 9.9.1 The Contractor shall review for compliance with the Contract Documents and submit to the Architect Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents in coordination with the Contractor's construction schedule and in such sequence as to allow the Architect reasonable time for review. 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. The Work shall be in accordance with approved submittals.

§ 9.9.2 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents.

§ 9.9.3 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 or unless the Contractor needs to provide such services in order to carry out the Contractor's own responsibilities. If professional design services or certifications by a design professional are specifically required, the Owner and the Architect will specify the performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional. If no criteria are specified, the design shall comply with applicable codes and ordinances. Each Party shall be entitled to rely upon the information provided by the other Party. The Architect will review and approve or take other appropriate action on submittals for the limited purpose of checking for conformance with information provided and the design concept expressed in the Contract Documents. The Architect's review of Shop Drawings, Product Data, Samples, and similar submittals shall be for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. In performing such review, the Architect will approve, or take other appropriate action upon, the Contractor's Shop Drawings, Product Data, Samples, and similar submittals.

§ 9.10 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.

§ 9.11 Cutting and Patching
The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

§ 9.12 Cleaning Up
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 material from and about the Project.

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

§ 9.14 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.

§ 9.15 Indemnification
§ 9.15.1 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 which would otherwise exist as to a party or person described in this Section 9.15.1.

§ 9.15.2 In claims against any person or entity indemnified under this Section 9.15 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 9.15.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 10 ARCHITECT
§ 10.1 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, unless otherwise modified in writing in accordance with other provisions of the Contract.

§ 10.2 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.

§ 10.3 The Architect will visit the site at intervals appropriate to the stage of the construction 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 safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 10.4 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.

§ 10.5 Based on the Architect's evaluations of the Work and 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.

§ 10.6 The Architect has authority to reject Work that does not conform to the Contract Documents and to require inspection or testing of the Work.

§ 10.7 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.

§ 10.8 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 will make initial decisions on all claims, disputes, and other matters in question between the Owner and Contractor but will not be liable for results of any interpretations or decisions rendered in good faith.

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

ARTICLE 11 SUBCONTRACTORS

§ 11.1 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.

§ 11.2 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 Subcontractors or suppliers proposed for each of the principal portions of the Work. The Contractor shall not contract with any Subcontractor or supplier to whom the Owner or Architect has made reasonable written objection within ten days after receipt of the Contractor's list of Subcontractors and suppliers. 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. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 11.3 Contracts between the Contractor and Subcontractors shall (1) require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the 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, which the Contractor, by the Contract Documents, assumes toward the Owner and Architect, and (2) allow the Subcontractor the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner.

ARTICLE 12 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 12.1 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.

§ 12.2 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 activities with theirs as required by the Contract Documents.

§ 12.3 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a Separate Contractor because of delays, improperly timed activities, or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work, or defective construction of a Separate Contractor.

ARTICLE 13 CHANGES IN THE WORK

§ 13.1 By appropriate Modification, changes in the Work may be accomplished after execution of the Contract. The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, with the Contract Sum and Contract Time being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Owner, Contractor, and Architect, or by written Construction Change Directive signed by the Owner and Architect. Upon issuance of the Change Order or Construction Change Directive, the Contractor shall proceed promptly with such changes in the Work, unless otherwise provided in the Change Order or Construction Change Directive.

§ 13.2 Adjustments in the Contract Sum and Contract Time resulting from a change in the Work shall be determined by mutual agreement of the parties or, in the case of a Construction Change Directive signed only by the Owner and Architect, by the Contractor's cost of labor, material, equipment, and reasonable overhead and profit, unless the parties agree on another method for determining the cost or credit. Pending final determination of the total cost of a Construction Change Directive, the Contractor may request payment for Work completed pursuant to the Construction Change Directive. The Architect will make an interim determination of the amount of payment due for purposes of certifying the Contractor's monthly Application for Payment. When the Owner and Contractor agree on adjustments to the Contract Sum and Contract Time arising from a Construction Change Directive, the Architect will prepare a Change Order.

§ 13.3 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly. 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.

§ 13.4 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be equitably adjusted as mutually agreed between the Owner and Contractor; provided that the Contractor provides notice to the Owner and Architect promptly and before conditions are disturbed.

ARTICLE 14 TIME

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

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

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

§ 14.4 The date of Substantial Completion is the date certified by the Architect in accordance with Section 15.6.3.

§ 14.5 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) changes ordered in the Work; (2) by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions not reasonably anticipatable, unavoidable casualties, or any causes beyond the Contractor's control; or (3) 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, subject to the provisions of Article 21.

ARTICLE 15 PAYMENTS AND COMPLETION

§ 15.1 Schedule of Values

§ 15.1.1 Where the Contract is based on a Stipulated Sum or the Cost of the Work with a Guaranteed Maximum Price pursuant to Section 3.2 or 3.4, the Contractor shall submit a schedule of values to the Architect before the first

Application for Payment, allocating the entire Stipulated Sum or Guaranteed Maximum Price 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 of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 15.1.2 The allocation of the Stipulated Sum or Guaranteed Maximum Price under this Section 15.1 shall not constitute a separate stipulated sum or guaranteed maximum price for each individual line item in the schedule of values.

§ 15.2 Control Estimate

§ 15.2.1 Where the Contract Sum is the Cost of the Work, plus the Contractor's Fee without a Guaranteed Maximum Price pursuant to Section 3.3, the Contractor shall prepare and submit to the Owner a Control Estimate within 14 days of executing this Agreement. The Control Estimate shall include the estimated Cost of the Work plus the Contractor's Fee.

§ 15.2.2 The Control Estimate shall include:

- **.1** the documents enumerated in Article 6, including all Modifications thereto;
- **.2** a list of the assumptions made by the Contractor in the preparation of the Control Estimate to supplement the information provided by the Owner and contained in the Contract Documents;
- **.3** a statement of the estimated Cost of the Work organized by trade categories or systems and the Contractor's Fee;
- **.4** a project schedule upon which the Control Estimate is based, indicating proposed Subcontractors, activity sequences and durations, milestone dates for receipt and approval of pertinent information, schedule of shop drawings and samples, procurement and delivery of materials or equipment the Owner's occupancy requirements, and the date of Substantial Completion; and
- **.5** a list of any contingency amounts included in the Control Estimate for further development of design and construction.

§ 15.2.3 When the Control Estimate is acceptable to the Owner and Architect, the Owner shall acknowledge it in writing. The Owner's acceptance of the Control Estimate does not imply that the Control Estimate constitutes a Guaranteed Maximum Price.

§ 15.2.4 The Contractor shall develop and implement a detailed system of cost control that will provide the Owner and Architect with timely information as to the anticipated total Cost of the Work. The cost control system shall compare the Control Estimate with the actual cost for activities in progress and estimates for uncompleted tasks and proposed changes. This information shall be reported to the Owner, in writing, no later than the Contractor's first Application for Payment and shall be revised and submitted with each Application for Payment.

§ 15.2.5 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in the Control Estimate. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the Control Estimate and the revised Contract Documents.

§ 15.3 Applications for Payment

§ 15.3.1 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 15.1, for completed portions of the Work. The application shall be notarized, if required; be supported by all data substantiating the Contractor's right to payment that the Owner or Architect require; shall reflect retainage if provided for in the Contract Documents; and include any revised cost control information required by Section 15.2.4. 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.

§ 15.3.2 With each Application for Payment where the Contract Sum is based upon the Cost of the Work, or the Cost of the Work with a Guaranteed Maximum Price, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed progress

payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 15.3.3 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 stored, and protected from damage, off the site at a location agreed upon in writing.

§ 15.3.4 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 other encumbrances adverse to the Owner's interests.

§ 15.4 Certificates for Payment

§ 15.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner of the Architect's reasons for withholding certification in whole or in part as provided in Section 15.4.3.

§ 15.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluations 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 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.

§ 15.4.3 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 15.4.2 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 15.4.1. If the Contractor and the 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 9.2.2, because of

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

§ 15.4.4 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 15.4.3, in whole or in part, that party may submit a Claim in accordance with Article 21.

§ 15.5 Progress Payments

§ 15.5.1 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.

§ 15.5.2 Neither the Owner nor Architect shall have an obligation to pay or see to the payment of money to a Subcontractor or supplier except as may otherwise be required by law.

§ 15.5.3 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.

§ 15.5.4 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.

§ 15.6 Substantial Completion

§ 15.6.1 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.

§ 15.6.2 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.

§ 15.6.3 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. When the Architect determines that the Work or designated portion thereof is substantially complete, the Architect will issue a Certificate of Substantial Completion which 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.

§ 15.6.4 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.

§ 15.7 Final Completion and Final Payment

§ 15.7.1 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 and, 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 stated in Section 15.7.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 15.7.2 Final payment shall not become due until the Contractor has delivered to the Owner a complete release of all liens arising out of this Contract or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien 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 such lien, including costs and reasonable attorneys' fees.

§ 15.7.3 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.

§ 15.7.4 Acceptance of final payment by the Contractor, a Subcontractor or 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 the final Application for Payment.

ARTICLE 16 PROTECTION OF PERSONS AND PROPERTY

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

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

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 and property and their protection from damage, injury, or loss. The Contractor shall promptly remedy damage and loss to property 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 16.1.2 and 16.1.3. 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 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 9.15.

§ 16.2 Hazardous Materials and Substances

§ 16.2.1 The Contractor is responsible for compliance with the requirements of 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. 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 in the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 16.2.2 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 16.2.1 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.

§ 16.2.3 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 indemnify the Contractor for all cost and expense thereby incurred.

ARTICLE 17 INSURANCE AND BONDS

§ 17.1 Contractor's Insurance

§ 17.1.1 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 this Section 17.1 or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the insurance required by this Agreement from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 18.4, unless a different duration is stated below:

« »

§ 17.1.2 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than « » ($ « ») each occurrence, « » ($ « ») general aggregate, and « » ($ « ») aggregate for products-completed operations hazard, providing coverage for claims including

- **.1** damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- **.2** personal and advertising injury;
- **.3** damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- **.4** bodily injury or property damage arising out of completed operations; and
- **.5** the Contractor's indemnity obligations under Section 9.15.

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

§ 17.1.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as those required under Section 17.1.2 and 17.1.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ 17.1.5 Workers' Compensation at statutory limits.

§ 17.1.6 Employers' Liability with policy limits not less than « » ($ « ») each accident, « » ($ « ») each employee, and « » ($ « ») policy limit.

§ 17.1.7 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ 17.1.8 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ 17.1.9 Coverage under Sections 17.1.7 and 17.1.8 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ 17.1.10 The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Section 17.1 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the period required by Section 17.1.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy.

§ 17.1.11 The Contractor shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Contractor.

§ 17.1.12 To the fullest extent permitted by law, the Contractor shall cause the commercial liability coverage required by this Section 17.1 to include (1) the Owner, the Architect, and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's Consultants, CG 20 32 07 04.

§ 17.1.13 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 this Section 17.1, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 17.1.14 Other Insurance Provided by the Contractor
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ 17.2 Owner's Insurance
§ 17.2.1 Owner's Liability Insurance
The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 17.2.2 Property Insurance
§ 17.2.2.1 The Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed or materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section 17.2.2.2, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ 17.2.2.2 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section 17.2.2.1 or, if necessary, replace the insurance policy required under Section 17.2.2.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 18.4.

§ 17.2.2.3 If the insurance required by this Section 17.2.2 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ 17.2.2.4 If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 18.4, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ 17.2.2.5 Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Section 17.2.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by this Section 17.2.2. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ 17.2.2.6 Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any insurance required by this Section 17.2.2, 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.

§ 17.2.2.7 Waiver of Subrogation

§ 17.2.2.7.1 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 this 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 17.2.2.7 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.

§ 17.2.2.7.2 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 17.2.2.7.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 17.2.2.8 A loss insured under the Owner's property insurance 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. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements, written where legally required for validity, the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 17.2.3 Other Insurance Provided by the Owner

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

Coverage	Limits

§ 17.3 Performance Bond and Payment Bond

§ 17.3.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in the Contract Documents on the date of execution of the Contract.

§ 17.3.2 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.

ARTICLE 18 CORRECTION OF WORK

§ 18.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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, unless compensable under Section A.1.7.3 in Exhibit A, Determination of the Cost of the Work.

§ 18.2 In addition to the Contractor's obligations under Section 9.4, 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 15.6.3, or by terms of an 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.

§ 18.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 8.3.

§ 18.4 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.

§ 18.5 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Article 18.

ARTICLE 19 MISCELLANEOUS PROVISIONS

§ 19.1 Assignment of Contract

Neither party to the Contract shall assign the Contract without written consent of the other, except that 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 such assignment.

§ 19.2 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 21.6.

§ 19.3 Tests and Inspections

Tests, inspections, and approvals of portions of the Work required by the Contract Documents or by applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

« »
« »
« »
« »
« »

« »

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

« »
« »
« »
« »
« »
« »

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

ARTICLE 20 TERMINATION OF THE CONTRACT

§ 20.1 Termination by the Contractor

If the Architect fails to certify payment as provided in Section 15.4.1 for a period of 30 days through no fault of the Contractor, or if the Owner fails to make payment as provided in Section 4.1.3 for a period of 30 days, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 20.2 Termination by the Owner for Cause

§ 20.2.1 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- **.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.

§ 20.2.2 When any of the reasons described in Section 20.2.1 exists, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may, without prejudice to any other remedy the Owner may have and after giving the Contractor seven days' notice, terminate the Contract and take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever reasonable method the Owner may deem expedient. Upon 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.

§ 20.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 20.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

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

§ 20.3 Termination by the Owner for Convenience

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Owner shall pay the Contractor for Work executed; and costs incurred by reason of such termination, including costs attributable to termination of Subcontracts; and a termination fee, if any, as follows:
(Insert the amount of or method for determining the fee payable to the Contractor by the Owner following a termination for the Owner's convenience, if any.)

« »

ARTICLE 21 CLAIMS AND DISPUTES

§ 21.1 Claims, disputes, and other matters in question arising out of or relating to this Contract, including those alleging an error or omission by the Architect but excluding those arising under Section 16.2, shall be referred initially to the Architect for decision. Such matters, except those waived as provided for in Section 21.11 and Sections 15.7.3 and 15.7.4, shall, after initial decision by the Architect or 30 days after submission of the matter to the Architect, be subject to mediation as a condition precedent to binding dispute resolution.

§ 21.2 Notice of Claims

§ 21.2.1 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 18.2, shall be initiated by notice to the Architect 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.

§ 21.2.2 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 18.2, shall be initiated by notice to the other party.

§ 21.3 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 in accordance with the requirements of the final dispute resolution method selected in this Agreement whether in contract, tort, breach of warranty, or otherwise, 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 21.3.

§ 21.4 If a claim, dispute or other matter in question relates to or is the subject of a mechanic's lien, the party asserting such matter may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 21.5 The parties shall endeavor to resolve their disputes by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with their Construction Industry Mediation Procedures in effect on the date of this Agreement. A request for mediation shall be made in writing, delivered to the other party to this Agreement, and filed with the person or entity administering the mediation. The request may be made concurrently with the binding dispute resolution 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, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 21.6 If the parties have selected arbitration as the method for binding dispute resolution in this 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 the Construction Industry Arbitration Rules in effect on the date of this Agreement. 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 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.

§ 21.7 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation; (2) the arbitrations to be consolidated substantially involve common questions of law or fact; and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 21.8 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, any party to an arbitration 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 a Claim not described in the written Consent.

§ 21.9 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to this Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 21.10 Continuing Contract Performance

Pending final resolution of a Claim, except as otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 21.11 Waiver of Claims for Consequential Damages

The Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 20. Nothing contained in this Section 21.11 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

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

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

SECTION 00 9100

LIST OF SUBCONTRACTORS

PART 1 GENERAL:

1.01 DELIVERABLE DATE:

A. List of Subcontractors to be submitted no more than (2) two business days after the Bid Date.

1.02 PARTICULARS

A. Here within the list of Subcontractors submitted by:
   1. Contractor: _____
   2. To: Ford, Powell & Carson, Architects & Planners Inc.
   3. Dated: _____
   4. The following work will be performed (or Provided) by Subcontractors and coordinated by us:

1.03 LIST OF SUBCONTRACTORS

A. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

B. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

C. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

D. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

E. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

F. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

G. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

H. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

I. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

J. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

K. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

L. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

M. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

N. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

O. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

P. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

Q. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

R. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

S. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

T. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

U. Work Subject: _____
   1. Subcontractor Name: _____
   2. Address: _____
   3. Phone: _____

V. Work Subject: _____

1. Subcontractor Name: _____
2. Address: _____
3. Phone: _____

W. Work Subject: _____
1. Subcontractor Name: _____
2. Address: _____
3. Phone: _____

X. Work Subject: _____
1. Subcontractor Name: _____
2. Address: _____
3. Phone: _____

Y. Work Subject: _____
1. Subcontractor Name: _____
2. Address: _____
3. Phone: _____

Z. Work Subject: _____
1. Subcontractor Name: _____
2. Address: _____
3. Phone: _____

END OF SECTION

SECTION 00 9200

SUB-BIDDER QUALIFICATIONS

PART 1 GENERAL

1.01 DEFINITIONS:

A. Sub-Bidders (hereinafter "Contractor" or "Subcontractor"), are to use the following definitions for completing the attached forms.

1. Restoration: The process of returning a building as nearly as possible to its original form and condition, while retaining as much original material as possible.
2. Preservation: The process of necessary remedial work to maintain, stabilize and protect a building's structural and aesthetic integrity.
3. Renovation: The process of modifying an existing building for a new or updated use.
4. Rehabilitation: The process of altering or adding to a historic building to meet continuing or new uses while retaining the building's historic character.

1.02 SUB-BIDDER QUALIFICATION FORMS

A. The submission of signed Sub-Bidder Qualification Statements prior to or at the time of submitting bids or proposals is a requirement of the Contract Documents. All questions must be answered and the data given shall be clear and comprehensive. If copies of other documents will answer the question more completely, they may be attached and clearly documents will answer the question more completely, they may be attached and clearly labeled. If additional space is needed, additional pages may be attached and clearly labeled.

B. Qualification Statements shall include the names and reference information for the Sub-Bidder's Project Manager, Superintendent, Foreman and Crew Chief who will actually be performing the work.

C. Failure to answer the questions in a complete and satisfactory manner may result in the rejection of the bid. The Owner reserves the right to reject any sub-bidder who in the judgment of the Owner, and based on a review of the Qualifications Forms, is not qualified to perform the work of the Contract. The Owner's decisions regarding rejection of the bids based on a sub-bidder's qualifications shall be final.

D. Award of the contract is contingent upon satisfactory evaluation of the Sub-Bidder's overall qualifications and not necessarily contingent upon whether they have performed work on designated historic structures within the specified time period

E. By submitting its bid, Subcontractor accepts the evaluation process and acknowledges and accepts that the determination of the "most qualified" firm(s) will require subjective judgments by the Owner and Architect. Further, the Owner, Architect and Contractor may elect to reject all bids and/or elect not to contract with any firm.

F. The Owner shall be entitled to fully investigate every reference listed in response to questionnaires, and each entity referenced in any response to any question in the questionnaires. The Sub-bidders, by completing the questionnaires, expressly agree that information in possession of referenced entities may be made available to the Owner and Architect. Owner and Contractor agree that the Owner or Architect may contact any individual or entity for references, regardless of Sub-Bidder's listing or naming them.

G. Complete, true and accurate information shall be provided by the Contractor. The Contractor by submission of its qualifications, warrants and represents that, to the best of its knowledge and belief, the responses contained therein are true and accurate. The Contractor also acknowledges that the Owner is relying on the truth and accuracy of the responses contained therein. If it is later discovered that material information given in response to a question was provided by the Contractor, knowing it was false, such discovery shall constitute grounds for immediate termination or rescission by the Owner of any agreements between the Owner and the Contractor entered into subsequent to the furnishing of such false information.

H. The Owner reserves the right to notify the Contractor if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Contractor or a Subcontractor. If the Owner or Architect has reasonable objection to a proposed person or entity of the Contractor or Subcontractor otherwise deemed to be the best value and quality, the Contractor may submit a qualified substitute person or entity.

I. An adjustment in the Base Bid will not be permitted where Contractor proposes a qualified sub-bidder in the place of sub-bidder which is unqualified with respect to governing law or which is unwilling or unable to certify its competence as provided in the bidding documents.

J. Contractor will be further required to demonstrate competence to the Owner by means of submittals required under the above referenced technical sections.

K. These forms, their completion by the Contractor, and their use by the Owner, shall not give rise to any liability on the part of the Owner or the Architect to the Contractor or any third party or person.

L. The Contractor may require additional information and does not take the place of the requirements of these Documents. If so, Contractor requested information will be submitted to Owner and Architect for review.

1.03 QUALITY ASSURANCE

A. Contractor is required to obtain and submit Sub-bidder certifications of compliance with specified qualification criteria and identify qualified Sub-bidders for indicated work categories prior to or included with submission of Bid.

B. Sub-Bidder companies shall have been in business for at least five (5) years at the time of submission of bids, unless noted otherwise in the specific specification section. The actual Installers (Project Manager/Foreman/Superintendent/Crew Chief) shall have a minimum of ten (10) years experience in the proposed area of work.

C. Contractor is required to submit Sub-Bidder Qualification Statement from each Sub-bidder proposing to perform the work in the following categories:
   1. Masonry Restoration
   2. Selective Demolition for Renovation
   3. Woodwork Restoration / Replication
   4. Roofing, Flashing and Trim
   5. Painting
   6. Metalwork

D. Qualification criteria is also stipulated in the individual sections of the specifications, which include reference to compliance with governing law of the State of Texas. Qualification Forms are at the end of this section. Failure to submit accurate and properly executed forms may result in disqualification of Bid and award of subcontracts to entities capable of demonstrating compliance with the requirements.

1.04 ATTACHMENT

Section 00 9250 - SUBCONTRACTOR QUALIFICATION STATEMENT

END OF SECTION

SECTION 00 9250

SUB-BIDDER QUALIFICATIONS STATEMENT AND CERTIFICATIONS

PART 1 GENERAL

INSTRUCTIONS:

This form must be completed, reviewed and signed by Sub-bidder, and returned to the General Contractor as stipulated in the "SUB-BIDDER QUALIFICATIONS" section 00 9200 of the Project Manual and as indicated on the Sub-Bid Form. General Contractor which proposes to perform designated category of work with its own forces shall complete this statement and certification in full. Contract may not be awarded until these documents are received. Submit certification statements for each entity Sub-bidder proposes to employ to perform a significant portion of an indicated work category. This includes Sub-sub bidders, fabricators and manufacturers, where applicable. More than one statement may be submitted for some work categories.

Refer to section 00 9200 for enumeration of work categories requiring certification.

DATE SUBMITTED:_____

FIRM NAME:_____

YEARS IN BUSINESS UNDER THIS NAME:_____

ADDRESS:_____

CITY:_____**STATE:**_____**ZIP CODE:**_____

TELEPHONE: (___) _____

NUMBER OF EMPLOYEES (PERMANENT): _____

NAME(S) OF PRINCIPAL(S) AND TITLE(S):

_____

_____

_____

_____

_____

_____

WORK CATAGORY: _____

NARRATIVE DESCRIBING THE FIRM'S LOCATION AND FACILITIES (PROVIDE INFORMATION REGARDING YOUR PLANT AND EQUIPMENT THAT PERTAINS TO YOUR ABILITY TO PERFORM THIS WORK. INCLUDE ADDITIONAL PAGES IF NECESSARY).

_____

_____

_____

NARRATIVE DESCRIBING THE FIRM'S EXPERIENCE IN PREPARING THE TYPE OF WORK SPECIFIED (INCLUDE ADDITIONAL PAGES IF NECESSARY. DESCRIBE YOUR FIRM'S EXPERIENCE - INCLUDE NUMBER OF YEARS IN RESTORATION/PRESERVATION CONSTRUCTION AND SPECIFIC ACCOMPLISHMENTS OF YOUR FIRM.)

_____

_____

_____

DESCRIBE YOUR FIRM'S QUALITY STANDARDS AND UNIQUE APPROACH (INCLUDE ADDITIONAL PAGES IF NECESSARY).

_____

_____

_____

NAME OF PROJECT CONTACT(S) AND TITLE (PROJECT MANAGER, FIELD SUPERINTENDENT, FOREMAN AND CREW CHIEF, ETC.):

_____

_____

_____

TYPE OF BUSINESS: _____

LICENSE#_____

DESCRIPTION OF WORK:_____

SPECIFICATION SECTIONS(S):_____

COMPANY EXPERIENCE - SIMILAR PROJECTS

LIST AT LEAST THREE (3) AND NO MORE THAN FIVE (5) PROJECTS OF REASONABLY SIMILAR NATURE, SCOPE, OR DURATION PERFORMED BY YOUR COMPANY IN THE LAST SEVEN YEARS, SPECIFYING, WHERE POSSIBLE, THE NAME AND LAST KNOWN ADDRESS AND TELEPHONE NUMBER OF EACH OWNER OF THOSE PROJECTS AND THE PHONE NUMBER, ADDRESS, AND NAME OF THE ARCHITECT OR GENERAL CONTRACTOR. INCLUDE A BRIEF DESCRIPTION OF MATERIALS AND METHODS USED TO PERFORM THE WORK. INDICATE APPROXIMATE DATE OF ORIGINAL BUILDING CONSTRUCTION. INCLUDE APPROXIMATE COST OF SUBCONTRACTS. USE ADDITIONAL PAGES IF NECESSARY.

PROJECT #1

_____

_____

_____

APPROXIMATE COST:_____

OWNER: _____**PHONE:** _____

ARCHITECT/CONTRACTOR:_____**PHONE:**_____

PROJECT #2

_____

_____

_____

APPROXIMATE COST:_____

OWNER: _____**PHONE:** _____

ARCHITECT/CONTRACTOR:_____**PHONE:**_____

PROJECT #3

_____

_____

_____

APPROXIMATE COST:_____

OWNER: _____**PHONE:** _____

ARCHITECT/CONTRACTOR:_____**PHONE:**_____

PROPOSED FIELD SUPERINTENDENT- NAME:_____

LIST THE QUALIFICATIONS AND BACKGROUND OF YOUR PROPOSED JOB SUPERINTENDENT (IF DIFFERENT INDIVIDUAL THAN THE PROJECT MANAGER) AND INCLUDE THE NAMES AND ADDRESSES OF COMPANIES HE/SHE HAS BEEN AFFILIATED WITH IN THE LAST TEN YEARS. INCLUDE A CONTACT PERSON AND PHONE NUMBER.

(FOR MANUFACTURER, LIST QUALIFICATIONS OF FIELD REPRESENTATIVE). ATTACH A RESUME OR USE ADDITIONAL PAGES.

LIST AT LEAST THREE (3) PROJECTS THAT THE PROPOSED SUPERINTENDENT HAS SUPERVISED THE SCHEDULED WORK IN THE LAST TEN (1) YEARS, FOR THE CONTRACTOR, OR FOR ANY OTHER COMPANY. STATE NAMES OF PROJECTS, NAMES OF OWNERS AND ARCHITECTS OF RECORD, PHONE NUMBERS AND/OR ADDRESSES. USE ADDITIONAL PAGES AS NECESSARY.

_____

_____

_____

PROPOSED FOREMAN - NAME:_____

LIST THE QUALIFICATIONS AND BACKGROUND OF YOUR PROPOSED FOREMAN (IF DIFFERENT INDIVIDUAL THAN THE SUPERINTENDENT) AND INCLUDE THE NAMES AND ADDRESSES OF COMPANIES HE/SHE HAS BEEN AFFILIATED WITH IN THE LAST TEN YEARS. INCLUDE A CONTACT PERSON AND PHONE NUMBER. (FOR MANUFACTURER, LIST QUALIFICATIONS OF FIELD REPRESENTATIVE). ATTACH A RESUME OR USE ADDITIONAL PAGES.

LIST AT LEAST THREE (3) PROJECTS THAT THE PROPOSED FOREMAN HAS SUPERVISED THE SCHEDULED WORK IN THE LAST TEN (1) YEARS, FOR THE CONTRACTOR, OR FOR ANY OTHER COMPANY. STATE NAMES OF PROJECTS, NAMES OF OWNERS AND ARCHITECTS OF RECORD, PHONE NUMBERS AND/OR ADDRESSES, AND APPROXIMATE COST OF SUBCONTRACTS. USE ADDITIONAL PAGES IF NECESSARY.

_____

_____

_____

PROPOSED CREW CHIEF - NAME: _____

LIST THE QUALIFICATIONS AND BACKGROUND OF YOUR PROPOSED CREW CHIEF (IF DIFFERENT INDIVIDUAL THAN THE FOREMAN) AND INCLUDE THE NAMES AND ADDRESSES OF COMPANIES HE/SHE HAS BEEN AFFILIATED WITH IN THE LAST TEN YEARS. INCLUDE A CONTACT PERSON AND PHONE NUMBER. ATTACH A RESUME OR USE ADDITIONAL PAGES.

LIST AT LEAST THREE (3) PROJECTS THAT THE PROPOSED CREW CHIEF HAS SUPERVISED THE SCHEDULED WORK IN THE LAST TEN (1) YEARS, FOR THE CONTRACTOR, OR FOR ANY OTHER COMPANY. STATE NAMES OF PROJECTS, NAMES OF OWNERS AND ARCHITECTS OF RECORD, PHONE NUMBERS AND/OR ADDRESSES, AND APPROXIMATE COST OF SUBCONTRACTS. USE ADDITIONAL PAGES IF NECESSARY

_____

_____

_____

PERCENTAGE OF WORK YOU WILL PERFORM OR PRODUCE WITH YOUR OWN FORCES: _____%

PERCENTAGE OF WORK YOU WILL SUB-CONTRACT TO ANOTHER ENTITY: _____%

IF SUB-CONTRACTING ANY PERCENTAGE OF WORK, PROVIDE INFORMATION LISTED ABOVE FOR PROPOSED PROJECT MANAGER, SUPERINTENDENT, FOREMAN AND CREW CHIEF.

CERTIFICATION OF COMPETENCE:

The undersigned or a duly authorized agent of the undersigned has reviewed the Contract Documents, familiarized himself/herself with the local conditions under which the Work is to be performed, has correlated these observations with the Contract requirements, and hereby certifies that he/she possesses the required qualifications to perform the Work indicated in accordance with the Contract Documents. The undersigned certifies that the information contained in this statement is true and accurate.

SIGNATURE OF PRINCIPAL: _____

TITLE: _____

PRINT NAME: _____

DATE:_____

END OF SECTION

SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: 114 E. Main Plaza Renovation.

B. Owner's Name: Lisa Wong.

C. Architect's Name: Ford, Powell and Carson, Inc..

D. The Project consists of the alteration of two existing structures to include include two residential apartments and a white box commercial space .

1.02 CONTRACT DESCRIPTION

1.03 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.05 WORK SEQUENCE

A. Coordinate construction schedule and operations with Architect.

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Price and Contract Time.

1.02 RELATED REQUIREMENTS

1.03 ACCEPTANCE OF ALTERNATES

A. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Ramp at interior between North & South Building:
Base Bid Item: Ramp connecting North & South Building not provided.
Alternate Item: Reference Key Note #14 sheet A101. Provide metal ramp.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Form (before award of contract):

B. Owner will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):

B. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.
B. Electronic document submittal service.
C. Site mobilization meeting.
D. Construction progress schedule.
E. Progress photographs.
F. Coordination drawings.
G. Submittals for review and information.
H. Number of copies of submittals.
I. Requests for Interpretation (RFI) procedures.
J. Submittal procedures.
K. Permitting Requirements.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Manufacturer's instructions and field reports.
   5. Applications for payment and change order requests.
   6. Progress schedules.
   7. Coordination drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. It is Contractor's responsibility to submit documents in allowable format.
   3. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

3.02 PRECONSTRUCTION MEETING

A. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. Mechanical / Electrical / Structural Engineers
   5. Subcontractors.

B. Agenda:
   1. Submission of executed bonds and insurance certificates.
   2. Distribution of Contract Documents.
   3. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
   4. Designation of personnel representing the parties to Contractor, Owner and Architect.
   5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   6. Contractor to submit a schedule and a work plan. The work plan will outline the areas of the building to be completed in conjunction with the schedule.

C. Record minutes and distribute copies within two days after meeting to participants, with two copies to Design-Build Team, including Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Architect will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
   1. Contractor.
   2. Architect.
   3. Contractor's superintendent.
   4. 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 distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's superintendent.
   5. Major subcontractors.

3.05 CONSTRUCTION PROGRESS SCHEDULE

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

3.06 PROGRESS PHOTOGRAPHS

A. See Section 01 3233 Photo Documentation for site photography requirements.

3.07 COORDINATION DRAWINGS

A. Review drawings prior to submission to Architect.

3.08 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
   2. Prepare using software provided by the Electronic Document Submittal Service.

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Discrete and consecutive RFI number, and descriptive subject/title.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Highlight items requiring priority or expedited response.

3.09 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.

5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

3.13 SUBMITTAL PROCEDURES

A. General Requirements:
1. Use a single transmittal for related items.
2. Transmit using approved form.
a. Use Contractor's form, subject to prior approval by Architect.
3. Sequentially identify each item. For revised submittals use original number and a sequential alphabetical suffix.
4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
a. Deliver submittals to Architect at business address.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. Provide space for Contractor and Architect review stamps.
10. When revised for resubmission, identify all changes made since previous submission.
11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
13. Submittals not requested will not be recognized or processed.

B. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.14 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:

1. Authorizing purchasing, fabrication, delivery, and installation:
   a. "Approved", or language with same legal meaning.
   b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
      1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
   c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
2. Not Authorizing fabrication, delivery, and installation:

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

3.15 PERMITTING REQUIREMENTS

A. All permitting is the responsibility of the General Contractor unless indicated otherwise.
   1. Architect assumes responsibility for Texas Historical Commission Historic Structure (Architecture) permitting.

END OF SECTION

SECTION 01 3233

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Periodic construction photographs.
   3. Final Completion construction photographs.

B. Photographic documentation is a significant part of the record of the project work.

1.02 REFERENCE STANDARDS

A. Texas Historic Preservation Tax Credit Application Guide; Texas Historical Commission; current edition.

B. Antiquities Permit Completion Report Form, Historic Buildings and Structures; Texas Historical Commission; current edition.

1.03 ALLOWANCE

A. Costs: All costs associated with construction photographs to be included in Base Bid.

1.04 UNIT PRICES

Basis for Bids: Base bid number of construction photographs on minimum of ten (10) representative photographs per month, including Before, During, and After photographs over the duration of Project.

1.05 PERFORMANCE REQUIREMENTS

A. Photographs should clearly depict the appearance of the building or building element. Photographs that are blurry, out-of-focus, underexposed, overexposed, or pixilated will not be accepted.

B. Minimum photographic requirements: Provide images in uncompressed .JPG format, produced by a digital camera, with resolution of at least 300 pixels per inch with an image size of at least 1600 x 1200 pixels.

1.06 SUBMITTALS

A. Key Plan: Submit an annotated key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.

B. Photographic Index:
   1. With the key plan, provide a written description of each image, including:
      a. A header indicating the Building name (if applicable) and address.
      b. Photograph file name.
      c. View Shown (eg. north side).
      d. Description of the view (eg. plaster damage in dining room, north wall). Indicate location, general direction (by compass point) and elevation or story of construction.
      e. Date photograph was taken.

C. Construction Photographs: Submit one digital copy of each photographic view within 14 days of taking photographs.
   1. Identification: On the label side of CD-ROM or USB flashdrive, provide an applied label with the following information:
      a. Name of Project and Project Number.
      b. Name of Architect.
      c. Name of Contractor.
      d. Date photographs were taken.

e. Include both Key Plan and Photographic Index as digital files on the CD-ROM or USB flashdrive.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

A. Maintain key plan with each set of photographs that identifies each photographic location.
   1. Before, During, and After images of the project work shall be from the same locations to clearly illustrate work as it progresses.
   2. Additional views may be added during construction, as necessary to document the work.

B. Date and Time: Include date and time in filename for each image.

C. Preconstruction Photographs:
   1. Submit photographs showing all existing conditions of the building immediately prior to any construction work.
   2. Include photographs of the building's site and environment, all of the building's sides, all major interior spaces and features, and representative secondary spaces and features.
   3. **Submit Preconstruction Photographs to Architect for approval prior to any construction activities.** Allow seven business days for review before commencing construction activities.

D. Periodic Construction Photographs: Take periodic digital photographs during the course of demolition and construction weekly.
   1. Every week, provide images at all vantage points used for the Preconstruction Photographs.
   2. Select additional vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs:
   1. Provide images at all vantage points used for the Preconstruction Photographs and Periodic Construction Photographs.
   2. Select additional vantage points as necessary to show all completed work

END OF SECTION

SECTION 01 3510

SPECIAL PROCEDURES FOR HISTORIC TREATMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes special procedures for historic treatment on Project including, but not limited to, the following:
   1. Storage and protection of existing historic materials.
   2. Temporary protection of historic materials during construction.
   3. Historic treatment procedures.

1.02 DEFINITIONS

A. "Preservation": To apply measures necessary to sustain the existing form, integrity, and materials of a historic property. Work may include preliminary measures to protect and stabilize the property.

B. "Renovation": To make possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features that convey its historical, cultural, or architectural values.

C. "Restoration": To accurately depict the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and the reconstruction of missing features from the restoration period.

D. "Reconstruction": To reproduce in the exact form and detail a building, structure, or artifact as it appeared at a specific period in time.

E. "Stabilize": To apply measures designed to re-establish a weather-resistant enclosure and the structural reinforcement of an item or portion of the building while maintaining the essential form as it exists at present.

F. "Protect and Maintain": To remove deteriorating corrosion, reapply protective coatings, and install protective measures such as temporary guards; to provide the least degree of intervention.

G. "Repair": To stabilize, consolidate, or conserve; to retain existing materials and features while employing as little new material as possible. Repair includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials. Within restoration, repair also includes limited replacement in kind, rehabilitation, and reconstruction, with compatible substitute materials for deteriorated or missing parts of features when there are surviving prototypes.

H. "Replace": To duplicate and replace entire features with new material in kind. Replacement includes the following conditions:
   1. Duplication: Includes replacing elements damaged beyond repair or missing. Original material is indicated as the pattern for creating new duplicated elements.
   2. Replacement with New Materials: Includes replacement with new material when original material is not available as patterns for creating new duplicated elements.
   3. Replacement with Substitute Materials: Includes replacement with compatible substitute materials. Substitute materials are not allowed, unless otherwise indicated.

I. "Remove": To detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

J. "Remove and Salvage": To detach items from existing construction and deliver them to Owner ready for reuse.

K. "Remove and Reinstall": To detach items from existing construction, repair and clean them for reuse, and reinstall them where indicated.

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

M. "Material in Kind": Material that matches existing materials, as much as possible, in species, cut, color, grain, and finish.

1.03 SUBMITTALS

A. Alternative Methods and Materials: If alternative methods and materials to those indicated are proposed for any phase of work, provide a written description including evidence of successful use on other, comparable projects, and program of scientific testing to demonstrate equal effectiveness for use on this Project.

B. Qualification Data: For historic treatment specialists and supervisory personnel. Include list of completed projects with the scope of work and budget for each.

C. Record Documents: Include modifications to manufacturer's written instructions and procedures as the Work progresses.

1.04 STORAGE AND PROTECTION OF HISTORIC MATERIALS

A. Removed and Salvaged Materials:
1. Clean salvaged historic items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Transport items to Owner's storage area designated by Owner, unless otherwise indicated on Drawings.
4. Protect items from damage during transport and storage.
5. Do not dispose of items or historic materials removed from existing construction without prior written consent of Owner.

B. Removed and Reinstalled Materials:
1. Clean and repair historic items to functional condition adequate for intended reuse.
2. If removed items are to be stored for a period of time prior to reinstallation, 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.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling during construction. When appropriate and if contractor demonstrates that damage to historic fabric is negligible, items may be removed to a suitable, protected storage location during construction and cleaned and reinstalled in their original locations after construction operations are complete.

D. Storage and Protection: When removed from their existing location, store historic materials within a weather-tight enclosure where they are protected from wetting by rain, snow, or ground water, and temperature variations. Secure stored materials to protect from theft.
1. Identify removed items with an inconspicuous mark indicating their original location.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.01 PROTECTION, GENERAL

A. Comply with manufacturer's written instructions for precautions and effects of products and procedures on adjacent building materials, components, and vegetation.

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

C. Temporary Protection of Historic Materials during Construction:
1. Protect existing materials during installation of temporary protections and construction. Do not deface or remove existing materials.
2. Attachments of temporary protection to existing construction shall be approved by Architect prior to installation.

D. Existing Drains: Prior to the start of work or any cleaning operations, test drains and other water removal systems to ensure that drains and systems are functioning properly. Notify Owner immediately of drains or systems that are stopped or blocked. Do not begin Work of this Section until the drains are in working order.
   1. Provide a method to prevent solids including stone or mortar residue from entering the drains or drain lines. Clean out drains and drain lines that become blocked or filled by sand or any other solids because of work performed under this Contract.
   2. Protect storm drains from pollutants including lead paint residues. Block drains or filter out sediments, allowing only clean water to pass.

3.02 HISTORIC TREATMENT PROCEDURES

A. The principal aim of preservation work is to halt the process of deterioration and stabilize the item's condition, unless otherwise indicated. Repair is required where specifically indicated. The following procedures shall be followed:
   1. Retain as much existing material as possible; repair and consolidate rather than replace.
   2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
   3. Use reversible processes wherever possible.
   4. Use traditional replacement materials and techniques. New work shall be distinguishable to the trained eye, on close inspection, from old work.
   5. Record the work before the procedure with preconstruction photos and during the work with periodic construction photos.

B. Prohibit smoking by personnel performing work on or near historic structures.

C. Where Work requires existing features to be removed, cleaned, and reused, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.

D. When cleaning, match samples of existing materials that have been cleaned and identified for acceptable cleaning levels. Avoid overcleaning to prevent damage to existing materials during cleaning.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

1.02 REFERENCE STANDARDS

A. International Conference of Building Officials. 1997 Uniform Building Code, Vol. 1, Chapter 33, 'Site Work, Demolition, and Construction.'

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For standard manufactured products submit product data describing characteristics.

1.04 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical power , consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. Existing facilities may be used.

1.05 TEMPORARY SANITARY FACILITIES

A. Use of existing facilities is permitted.

B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

1.07 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 VEHICULAR ACCESS AND PARKING

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

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Subcontractors will be responsible for providing their own off-site parking. No on-site parking is available.

D. Do not allow vehicle parking on existing pavements.

1.09 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

C. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

D. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.02 DAY-BY-DAY CLEAN-UP

A. Cleaning: Remove staining or reactive materials from new and existing surfaces immediately during course of the Work.

B. Debris: Remove hazardous accumulations of debris promptly, at least daily.

C. Dust: Confine or prohibit dust producing operations during painting and finishing.

3.03 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

END OF SECTION

SECTION 01 5723

TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 GENERAL

1.01 DEFINITIONS

A. BMP – Best Management Practices
B. TCEQ – Texas Commission on Environmental Quality
C. TPDES – Texas Pollutant Discharge Elimination System
D. Large Construction Activities – Construction activities including clearing, grading and excavating that result in land disturbance of equal to or greater than five (5) acres.
E. Small Construction Activities - Construction activities including clearing, grading and excavating that result in land disturbance of equal to or greater than one (1) acre and less than five (5) acres of land.

1.02 RELATED DOCUMENTS AND APPLICABLE WORK

A. The TCEQ TPDES Construction General Permit No. TXR150000, issued March 5, 2018, requires large construction activities of five (5) acres or more and small construction activities which disturb one (1) to less than five (5) acres to comply with all provisions of the TCEQ storm water discharge guidelines. This project disturbs less than (1) acres of land and coverage under the General Permit is not required.
B. The work described in this section is applicable to any and all sections of the Contract Documents. Any and all work that would disturb the existing site conditions or present the potential for site run-off shall adhere fully to this specification section.
C. Unless specifically notified to the contrary by the Owner, in writing, all aspects of this specification shall apply to this project.

1.03 CONTRACTOR RESPONSIBILITIES

A. This project requires implementation of storm water “Best Management Practices” (BMP) for control devices and monitoring by the Contractor.
B. The Contractor shall verify existing conditions at the site before determining scope of implementation of site controls. Site survey and site plan drawings shall be used for additional reference. The Contractor shall notify the Owner, in advance, of this site review to allow for Owner participation.
C. Contractor shall contact City Construction Inspector (CI) for review of initial site controls in place prior to commencing site-disturbing activities, to ensure that any unusual circumstances or unforeseen site conditions with regard to erosion and sedimentation have been addressed.
D. The Contractor shall provide all material, labor, equipment and services required to implement, maintain and monitor all erosion and sedimentation controls. These controls shall remain in operation until project completion and reestablishment of the site or longer as directed by the Resident Construction Manager (RCM). The work shall include, but not be limited to the following:
    1. All earthwork as required to implement swales, dikes, basins and other excavations for temporary routing of utilities, to protect against erosion or sediment-laden (“polluted”) storm water runoff.
    2. All structural controls as shown or specified, including silt fences, sediment traps, stabilized construction entrance, subsurface drains, pipe slope drains, inlet/outlet protection, reinforced soil retention, gabions, rock berms, etc.
    3. All non-structural controls as shown or specified, including temporary or permanent vegetation, mulching, geotextiles, sod stabilization, preservation of vegetative buffer strips, preservation/protection of existing trees and other mature vegetation.
    4. Monitoring changing site conditions to address new sources of storm water discharges as the work progresses.
    5. All maintenance and repair of structural and non-structural controls in place shall continue until final stabilization is achieved or as directed by the RCM.
    6. Weekly site inspections of pollutant sources, including hazardous sources, structural and non-structural controls, and maintenance of inspection records.

7. Removal of all structural and non-structural controls as necessary upon completion, and only after final stabilization is achieved.

1.04 QUALITY ASSURANCE

A. In order to minimize the discharge of pollutants to storm water, the Contractor shall implement all permanent and temporary site controls according to Texas Pollutant Discharge Elimination System (TPDES) Guidelines, as set forth by the Texas Commission on Environmental Quality.

B. Implementation of site controls shall be performed by a qualified contractor experienced in the proper installation of such devices in accordance with manufacturers' specifications, and in keeping with recognized Best Management Practices (BMP's). Qualification of installing Contractor shall be reviewed with the Owner prior to entering into a contract with them for services.

C. The Contractor shall inspect all BMP's at regular intervals. Record all deficiencies of site controls and take immediate action to correct any deficiencies recorded. Keep records of inspections current and on file, available for review by EPA, TCEQ, MS4 operator and Owner.

1.05 SUBMITTALS

A. Submittals of products used in structural and non-structural controls shall be made through established procedures for review and approved by the Owner prior to installation on the site. The Contractor shall make available physical samples and product literature on any material used in structural or non-structural controls during the project prior to its implementation in the field.

PART 2 PRODUCTS

2.01 MATERIALS

Specific site control devices are identified in the Erosion and Sedimentation Control Plan. Where such devices are indicated, their material composition shall comply with this section.

A. Materials to be used in structural and non-structural site controls shall include, but not be limited to the following:
   1. Area Inlets, Curb Inlets, and Silt Fences: Implemented to filter, and remove sediment from storm water shall be composed of the following materials:
      a. Geotextile fabric – a non-woven, polypropylene, polyethylene, or polyamide fabric with non- raveling edges. It shall be non- biodegradable, inert to most soil chemicals, ultraviolet resistant, unaffected by moisture and other weather conditions, and permeable to water while retaining sediment. Fabric shall be 36 inches wide, with a minimum weight of 4.5 oz/yd.
      b. Wire Backing – a galvanized, 2"x4", welded wire fencing, 12 gauge minimum. Width shall be sufficient to support geotextile fabric 24 inches above adjacent grades. Chain link fences located along the same lines as silt fences, may be used to support geotextile fabric. In this circumstance, the geotextile fabric shall be firmly attached to fence.
      c. Posts for area inlets and silt fences – steel fence posts shall be made of hot rolled steel, galvanized or painted, a minimum of 4 feet long, with a Y-bar or TEE cross-section of sufficient strength to withstand forces implied.

B. Rock Berms: Shall be composed of the following materials:
   1. Rock – clean open graded rock, with a maximum diameter of 3 inches
   2. Wire Mesh Support – a galvanized, woven wire sheathing having a maximum opening size of 1 inch, and a minimum wire diameter of 20 gauge
   3. Ties – metal hog rings or standard wire/cable ties

C. Triangular filter dikes: For use on surfaces or in locations where standard silt fence cannot be implemented, shall be composed of the following:
   1. Geotextile fabric – a non-woven, polypropylene, polyethylene, or polyamide fabric with non-raveling edges, in a minimum width of 60 inches.
   2. Dike Structure – 6 gauge, 6x6 welded wire mesh, 60 inches wide, folded into a

triangular form. Each side shall be 18 inches with an overlap of 6 inches.

3. Ties – metal hog rings or standard wire/cable ties for attachment of wire mesh to itself, and for attachment of geotextile fabric to wire mesh.

D. Stabilized construction exit: A steel grid that allows the safe passage of vehicles while agitating the tires to loosen and remove the soil build up. The grid or structures shall conform to the following:
   1. It shall consist of pipes or tubes spaced such that there is a minimum clear distance between the pipes or tubes of 4 ½". It shall be elevated above the ground surface a minimum of 8" to allow water, debris and soil to drain.
   2. Minimum diameter of pipe or tube shall be 3".
   3. It shall be designed to support any and all vehicles entering and leaving the construction site.
   4. It shall be firmly placed in the ground at the exit.
   5. It shall be of sufficient length so that the agitation will remove the soil from the tires or a minimum of 8'-0".
   6. At the street side approach of the grid there shall be an impervious surface, or it shall consist of 3" to 5" diameter angular crushed stone/rock approximately 5'-0" in length, minimum, and 8" deep, minimum. On the "job site" side of the grid, there shall be 3" to 5" diameter angular crushed stone/rock 15"-0" in length, minimum, 8" deep, minimum. The steel grid will be between the "street side" approach and the job site crushed stone/rock. All crushed stone/rock shall have filter fabric beneath the stone/rock.
   7. Steel grid area shall be used as the tire wash area. When tire wash is in use (rainy or muddy days) the area shall be manned, and the tires shall be washed using a high-pressure hose/nozzle.
   8. The area beneath the grid shall be sloped such that debris, soil and water shall be diverted back on to the construction site or to a sediment basin. No water, soil or debris shall leave the construction site. The resulting discharge shall be disposed of properly.

E. Concrete Truck Washout: Shall be used for containment of fluids from concrete truck washout wastes.
   1. Gravel bags, concrete blocks or open graded rock
   2. 10 mil plastic sheeting

F. Temporary Storage Tanks: Shall be used for temporary storage of fuels on the construction project site.
   1. 2 inches of sand on the bottom of the containment area
   2. 6 mil plastic sheeting
   3. 2 inches of sand on top of the plastic sheeting

G. Erosion Control Matting: Shall be used on steep slopes, in drainage swales, and in high traffic pedestrian areas of barren soil. It shall include one or more of the following:
   1. Jute Mat – a plain fabric made of jute yarn, woven in a loose and simple manner, with a minimum unit weight of 2.7 pounds per square yard. Width shall be as required for the dimensions of the area to be covered.
   2. Wood Fiber Mat – a mat composed of wood fibers, which are encased in nylon, cotton or other type of netting.
   3. Synthetic Webbing Mat – a mat manufactured from polyvinyl chloride or polypropylene monofilaments, which are bonded together into a three-dimensional web to facilitate erosion control and/or re- vegetation.

H. Organic mulches: Shall be used for covering bare soil, retaining moisture under existing vegetation being preserved, and for absorbing the energy of compaction caused by foot or vehicular traffic. Mulch shall be one or more of the following:
   1. Straw – from broken straw bales that are free of weed and grass seed where the grass from the seed is not desired vegetation for the area to be protected.
   2. Wood Chips – from chipped limbs of cleared trees on site, or delivered in chipped form, in bulk quantities of pine, cedar or cypress. Wood chips of all species shall

be partially decomposed to alleviate nitrogen depletion of the soil in areas where existing vegetation is to be preserved and protected.

3. Shredded Mulches – from pine, cypress or cedar, mechanically shredded, and capable of forming an interlocking mat following placement, and after sufficient wetting and drying has taken place naturally.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall provide a complete installation of all site control devices and measures (BMPs). Indicated in the Site Erosion and Sedimentation Control Drawing and as specified herein. These BMPs must be confirmed as fully operational with the Owner before any work that disturbs the site can begin.
As an alternative to the BMPs indicated in the Site Erosion and Sediment Control Drawing and as specified herein, the Contractor may propose alternate BMPs that perform the same function as the indicated BMP but may be of a different configuration, material or type for review and approval by the Owner. Installation of alternate BMPs shall not proceed until approved by the Owner.

B. The Contractor shall provide inspection and monitoring of controls in place. An accurate, chronological record of all Contractor inspections revisions and additional controls shall be kept on file at the project site.

C. The Contractor shall notify the Owner after all disturbed areas are re-established (stabilized) with vegetative cover following completion of construction. Following review of stabilized areas for non-compliance, all site controls that are no longer necessary shall be removed.

3.02 CONTROL DEVICES

Execution of specific site control devices is described in the following paragraphs. Refer to the Site Erosion and Sedimentation Control Drawing for applicable devices, extent and location.

A. Area Inlet Detail

1. Area inlet fences shall consist of non-woven geotextile fabric attached to wire fabric backing to support the geotextile. The wire fabric should be galvanized 2” x 4” welded wire, 12-gauge minimum. Attach non-woven geotextile fabric to the fence with hog rings or standard cable/wire ties, leaving a toe of fabric at the bottom of the fence of not less than 6 inches. Steel posts as specified shall be driven to a depth of 1 foot minimum and spaced not more than 6 feet on center. Attach fencing to posts with standard cable/wire ties. Abutting ends of geotextile fabric shall be overlapped a minimum of 12 inches. Wrap grates with non-woven geotextile fabric.
2. Maintain silt fence daily as necessary to repair breaches in geotextile fabric. Maintain steel posts as specified in tilted condition. When siltation has occurred, it shall be removed when it has reached a depth of 6 inches. Silt that has been removed shall be disposed of offsite.
3. Remove area inlet when the disturbed areas have been completely stabilized as specified. Minimize site disturbance while removing area inlet protection and posts.

B. Curb Inlet Protection

1. Cover curb storm inlet with non-woven geotextile fabric covered wire fabric. Wire fabric to be 2”X4” – W1.4XW1.4. Extend fabric 2(two) feet beyond inlet opening at each end and 12” (twelve) in front of opening in the gutter. Remove strip of filter fabric approx. 2 1/2” (two and one half) high for the length of the protection to act as overflow. Extend fabric over the top of opening to allow placement of gravel bags. Anchor fabric with 20 lb. gravel bags placed 3 (three) feet on center.
2. Maintain inlet protection daily as necessary to repair breaches in geotextile fabric. When siltation has occurred, it shall be removed when it has reached a depth of 2 (two) inches. Silt that has been removed shall be disposed of off-site.

C. Rock Berm

1. Rock berm shall consist of rip-rap type rock, secured within a wire sheathing as specified, and installed at the toe of slopes, or at the perimeter of developing or disturbed areas. Height of berm shall be a minimum of 18 (eighteen) inches from top

of berm to uphill toe of berm. Top width shall be a minimum of 24 (twenty-four) inches, with side slopes of 2:1 or flatter. Uphill toe of berm shall be buried a minimum of 4 (four) inches into existing grade. Rock berm shall have a minimum flow-through rate of 60 (sixty) gallons per minute, per square foot of berm face.

2. Maintain rock berm in a condition that allows the sediment to be removed, when the depth of sediment has reached 1/3 (one third) the height of the berm. Berm shall be reshaped as needed, and silt buildup removed, to maintain specified flow through berm.
3. Rock berm shall be removed when the disturbed areas served have been stabilized as specified.

D. Silt Fence

1. Silt fences shall consist of non-woven geotextile fabric, attached to wire fabric backing to support the geotextile. The wire fabric should be galvanized 2" x 4" welded wire, 12-gauge minimum. Attach non-woven geotextile fabric to fence with shoat or standard cable/wire ties, leaving a "toe" of fabric at the bottom of the fence of not less than 6 (six) inches. Steel posts as specified shall be driven to a depth of 1 (one) foot minimum and spaced not more than 6 (six) feet on center. Tilt posts slightly, in an "uphill" direction for additional strength. Attach fencing to posts with standard cable/wire ties. Dig a 6 (six) inch deep by 6 (six) inch wide trench on the disturbed side of the fence, bury geotextile fabric in trench, backfill and tamp. Abutting ends of geotextile fabric shall be overlapped a minimum of 12 (twelve) inches.
2. Maintain silt fence daily as necessary to repair breaches in geotextile fabric. Maintain steel posts as specified in tilted condition. When siltation has occurred, it shall be removed when it has reached a depth of 6 (six) inches. Silt that has been removed shall be disposed of off-site.
3. Remove silt fence when the disturbed areas protected by silt fence have been completely stabilized as specified. Minimize site disturbance while removing silt fence and posts.

E. Stabilized Construction Exit

1. A steel grid that allows the safe passage of vehicles while agitating the tires to loosen and remove the soil build up. The grid or structures shall conform to the following:
   a. It shall consist of pipes or tubes spaced such that there is a minimum clear distance between the pipes or tubes of 4 ½". It shall be elevated above the ground surface a minimum of 8" to allow water, debris and soil to drain.
   b. Minimum diameter of pipe or tube shall be 3".
   c. It shall be designed to support any and all vehicles entering and leaving the construction site.
   d. It shall be firmly placed in the ground at the exit.
   e. It shall be of sufficient length so that the agitation will remove the soil from the tires or a minimum of 8'-0".
   f. At the "street side" approach of the grid there shall be an impervious surface, or it shall consist of 3" to 5" diameter angular crushed stone/rock approximately 5'-0" in length, minimum, and 8" deep, minimum. On the "job site" side of the grid, there shall be 3" to 5" diameter angular crushed stone/rock 15"-0" in length, minimum, 8" deep, minimum. The steel grid will be between the "street side" approach and the job site crushed stone/rock. All crushed stone/rock shall have filter fabric beneath the stone/rock.
   g. Steel grid area shall be used as the tire wash area. When tire wash is in use (rainy or muddy days) the area shall be manned, and the tires shall be washed using a high-pressure hose/nozzle.
   h. The area beneath the grid shall be sloped such that debris, soil and water shall be diverted back on to the construction site or to a sediment basin. No water, soil or debris shall leave the construction site. The resulting discharge

shall be disposed of properly.

F. Concrete/Paints/Stucco/Equipment Washout (Self-Installed)

1. Concrete Truck Washout (self-installed) shall be constructed so that it will be able to accommodate the maximum number of anticipated concrete trucks that will be cleaned on any given day at any given time using 7 gallons of water being used for washout per truck or 50 gallons of water being used to wash out pump trucks. The area utilized to contain the wash water and concrete solids cleaned from the trucks will be a minimum of 10 feet in width. The containment area will be covered with 10 mil plastic sheeting without any holes or tears and the seams shall be sealed according to manufacturer's recommendations. The gravel bags, concrete blocks or open graded rocks shall line the outside perimeter and shall be double wrapped with the 10-mil plastic sheeting to prevent any potential for runoff from the containment area.
2. The concrete truck washout containment area shall be maintained in a condition that will not allow concrete build up within the containment area to exceed 50% of the storage capacity.
3. The concrete truck washout area will be removed when it is no longer necessary to wash out concrete trucks on the site.
4. Equipment Cleaning: Clean equipment in a manner that does not create any discharge of cleaning agents, paints, oil or solvents to a storm sewer, waterway or onto the ground. Soaps and detergents must never be discharged to the ground. Cement handling equipment must be rinsed in a contained area and there must be no drainage off-site or onto to ground.
5. When rinsing painting equipment/tools outside, rinse water must be contained in a bucket or other container for appropriate disposal.
6. Oil based paint wastes, including solvents and thinners, must not be disposed of in the sanitary sewer; they must be collected and disposed of through the contractor's disposal company in accordance with applicable laws and regulations.
7. Discharges from pressure washing using soaps or chemicals must not be allowed to enter a storm sewer. The wastewater will need to be collected with a berm and vacuumed (transported to appropriate disposal site). If the rinse only contains water and dirt (sediment) it may be spread on a grass area or contained/filtered with clean water allowed to enter storm sewer.

G. Temporary Storage Tanks

1. Must be located in a bermed containment area. The berm must be a minimum 3 feet in all directions, and the height of the berm must contain the maximum contents of the largest tank plus 8 inches (approximately 110% of the tank capacity). The containment area is constructed by beginning with a 2-inch sand pad, and then covered with 6-mil plastic or rubber sheeting. The sheeting is then covered with another 2-inch layer of sand. The plastic sheeting is secured to the outer berm.
2. Storage tanks are to be placed no closer than 50 feet from a building or property line.
3. If using tanks with a gravity feed type set up, the containment must be of sufficient size to be able to contain the tank if it should fall over.
4. There must be a fusible link at the valve that will shut off the flow to the hose in the event of a fire.
5. There must be sufficient cover for the tank and the containment area to prevent potential storm water runoff
6. The area within the containment area is to be kept free and clear of spills, if a spill occurs then the sand is to be removed and replace with a fresh layer of sand.
7. The storage tank containment area is to be removed from the site once it has been determined that it will no longer be used on the construction site.

H. Diversion Dikes

1. Diversion dikes shall be formed and shaped using compacted fill, and shall not intercept runoff from more than 10 (ten) acres. Dike shall have a minimum top width of 24 (twenty-four) inches, and a minimum height of 18 (eighteen) inches. Soil shall

have side slopes of 3:1 or flatter, and shall be placed in 8 (eight) inch lifts. Compact soil to 95% standard proctor density. Where protected slopes exceed 2 (two) percent, the uphill side of diversion dike shall be stabilized with crushed stone or erosion control matting – to a distance of not less than 7 (seven) feet from toe of dike. The channel, which is formed by the diversion dike, must have positive drainage for its entire length to a stabilized outlet, such as a rock berm, sandbag berm, or stone outlet structure. Storm water shall not be allowed to overflow the top of diversion dike at any point other than the stabilized outlet.

2. Maintain diversion dike in a condition that allows the storm water runoff to be diverted away from exposed slopes. Repair any failures at top of dike and remove sediment as necessary behind dike to allow positive drainage to a stabilized outlet.
3. Remove diversion dike when the expose slopes being protected are stabilized with vegetation or other permanent cover.

I. Interceptor Swale

1. Interceptor swale shall be implemented to prevent on or off-site storm water from entering a disturbed area or prevent sediment-laden runoff from leaving the site or disturbed area. Interceptor swale shall be excavated as required by the SWPPP drawing/s, with side slopes of 3:1 or flatter. This shall include all labor and equipment associated with the installation and maintenance of the swale as shown on the construction documents. Constructed swale may be v-shaped or trapezoidal with a flat bottom, depending on the volume of water being channeled. Sediment laden runoff from swale shall be directed to a stabilized outlet or sediment-trapping device. Flow line of swale shall have a continuous fall for its entire length and shall not be allowed to overflow at any other point/s along its length.
2. Maintain interceptor swale in a condition that allows the storm water runoff to be channeled away from disturbed areas. Remove sediment in swale as necessary to maintain positive drainage to a stabilized outlet.
3. Fill in or remove swale after the disturbed area/s being protected is completely stabilized as specified.

J. Erosion Control Matting

1. Remove all rocks, debris, dirt clods, roots, and any other obstructions, which would prevent the matting from lying in direct contact with the soil. 6 inch by 6 inch anchor trenches shall be dug along the entire perimeter of the installation. Bury matting in trenches, backfill and compact. Fasten matting to the soil using 10-gauge wire staples, 6 inches in length and 1 inch wide. Use a minimum of one staple per 4 square feet of matting, and at 12 inches on center along all edges. Install parallel to flow of water and overlap joining strips a minimum of 12 inches.
2. Maintain erosion control matting by repairing any bare spots. Missing or loosened matting shall be promptly replaced or re-anchored.
3. Remove matting where protection is no longer required. In areas where permanent vegetation is established along with matting, matting can be left in place permanently.

K. Mulches

1. Apply specified mulches in areas identified on the SWPPP, to a depth of 3 inches or as otherwise specified on the SWPPP drawing/s.

3.03 INSPECTIONS AND RECORD KEEPING

A. Contractor shall inspect all BMP's on 7-day intervals. Coordinate inspections with the Owner. Record all deficiencies of site controls and take appropriate action to correct any deficiencies recorded. Exception is rock berms located in a streambed. Any rock berm located in a streambed shall be inspected on a daily basis.

B. Contractor shall keep records of all major grading and stabilization activities on file available for review by Owner's representative(s) or other officials requesting review.

3.04 MAINTENANCE

A. All erosion and sediment control measures and other protective measures identified in the Site Erosion and Sedimentation Control Drawing must be maintained in effective operating condition. If through inspections the permittee determines that BMP's are not operating effectively, maintenance must be performed before the next anticipated storm event or as necessary to maintain the continued effectiveness of storm water controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. Erosion and sediment controls that have been intentionally disabled, run-over, removed or otherwise rendered ineffective must be replaced or corrected immediately upon discovery.

3.05 WASTE DISPOSAL

A. Contractor is responsible for proper disposal of hazardous materials. Hazardous wastes (such as flammable petroleum products and solvents, thinners) and materials contaminated with hazardous wastes are considered regulated wastes and should be containerized for transport and disposal by a permitted company in accordance with applicable laws and regulations.

B. Any trash or debris must be contained on site and disposed of in a recycling bin or waste receptacle in accordance with applicable laws and regulations to prevent wind or rain from carrying it off-site into a storm drain. Non-hazardous solid wastes such as general construction debris may be recycled or disposed of in the trash container. Never dispose of liquid wastes of any kind in the Owner's dumpsters.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

C. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.02 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Use of products having any of the following characteristics is not permitted:

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

C. Section 07 8400 - Firestopping.

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.03 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.04 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

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

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

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

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

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

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

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

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

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

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

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

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

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

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.09 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.10 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION

SECTION 02 4100

SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Demolition and removal of selected portions of a building.

B. Demolition and removal of selected site elements.

C. Removal of designated construction.

D. Protection of exposed building interior from weather.

E. Salvage of designated materials as indicated on Drawings

F. Storage of salvaged materials.

G. Inventory of salvaged materials for reuse.

H. Disposal of removed, non-salvaged materials.

I. Identification of existing utilities.

J. Refer to items scheduled at end of section and on the drawings for scope and location of selective demolition.

1.02 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence.

B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

D. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

E. Section 01 7800 - Closeout Submittals: Project record documents.

F. Section 04 0500 - Masonry Restoration and Cleaning

1.03 REFERENCE

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Alterations Schedule: Before commencing demolition, submit for approval a preliminary schedule showing alterations that will be required under Contract. Where scope of alterations is unclear within a specific area, refer uncertainties to the Architect and obtain clarification prior to proceeding. Record clarifications on Project Record Documents.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

A. Engage an experienced firm and construction personnel who have successfully completed demolition work similar to that required for this project. Unless otherwise indicated, selective demolition shall be performed by general contractor, electrical subcontractor, or HVAC subcontractor as applicable.

B. Conduct a pre-demolition conference. Refer to Conditions of Contract for meeting requirements.

1. Establish preliminary schedule for demolition activities that require inspection by Architect prior to or following activity

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Obtain required permits from appropriate authorities.

C. Do not close or obstruct egress from any building exit.

D. Do not disable or disrupt building fire or life safety systems without 72 hours prior written notice to the Owner's Representative.

E. Obtain instruction from the Owner on how to sound fire alarms at the building facility and the locations of existing fire extinguishers and fire fighting equipment. Obtain information from the Owner identifying locations of flammable liquids stored at the site and exhaust vent locations that may emit flammable materials or vapors.
   1. Prepare a memorandum accompanied by building diagram showing relevant information and circulate to Subcontractor and Contractors personnel.

F. Conform to applicable regulatory procedures when hazardous or contaminated materials are discovered. Should the Contractor encounter suspected hazardous materials other than those identified in the Contract Documents, they should immediately notify the Owner's representative.

1.07 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent building areas.

B. In order to provide optimum protection for the fabric of the existing historic building, Contractor and construction personnel shall observe the following procedures:
   1. No smoking shall be permitted in the interior of the building
   2. Food and beverages shall be consumed in areas designated by the Owner's representative, on the exterior of the building.
   3. No trash or flammable material storage of any type whatsoever shall be permitted inside the building.
   4. Limit volume of radios or stereos operated on this project.

C. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.

D. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

E. Protect finish floor coverings and other finishes to remain from marring and other damage. Maintain and leave protection in place until surface protected is no longer subject to damage by construction operations.

F. Remove carefully and protect items indicated to be reused. Store carefully in a safe location until reinstalled. Assume responsibility for safe storage and handling.

G. Damages: Promptly repair damages caused to adjacent finishes or facilities by demolition work to condition equivalent to that when work commenced at no additional cost to Owner.

H. If conditions are encountered which differ significantly from the assumptions indicated in the Contract Documents regarding typical conditions, immediately notify Architect and do not proceed without further instruction.

I. Cease operations immediately if structure appears to be in danger and notify Architect. Do not resume operations until directed.

J. Contractor's Property: Rubbish and debris created by demolition and alteration work, including cutting and drilling, patching and repair, and other demolished or removed materials and equipment not to be reused in the Work under this Contract, and not indicated to remain Owner's property, or selected by Owner to remain Owner's property, shall become Contractor's property and shall be removed from the site.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Report discrepancies to the Architect before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Provide adequate ventilation to prevent accumulation of hazardous fumes during application of solvent-based components in enclosed spaces, and maintain ventilation until materials have cured and solvents have been thoroughly dissipated. Provide products with the minimum solvent content suitable for the application and performances indicated.

B. Provide, erect, and maintain temporary barriers at locations indicated.

C. Erect and maintain secure weatherproof closures for exterior openings. Provide temporary weather protection during interval between demolition and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.

D. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise generated by construction operations.

E. Protect existing materials and equipment that are not to be demolished.
   1. Where indicated to remove and salvage, mark item in a concealed location with a waterproof, non-staining to exposed surfaces marker with unique number corresponding to marking on shop drawings. Mark number on substrate where item was removed and will be reinstalled.

F. Prevent movement of structure; provide bracing and shoring.

G. Disconnect electrical systems in walls, floors and ceilings to be removed.

H. Existing Electrical Service to the Building: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 72 hours before partially or completely disabling system.
   2. Make temporary connections to maintain service in areas adjacent to work area.

I. Notify affected utility companies before starting work and comply with their requirements.

J. Mark location and termination of utilities in record documents.

K. Provide appropriate temporary signage including signage for exit and building egress.

3.03 GENERAL

A. Take care to not destroy, remove or otherwise damage any concealed historic surfaces during demolition. If any previously unknown historic surfaces are discovered, stop demolition work immediately and notify Architect.

B. Disconnect, cap, and identify designated utilities within demolition areas.

C. Demolish in an orderly and careful manner. Protect existing supporting structural members.
   1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand-tools; do not use power driven impact tools.
      a. Exception: Power operated chipping hammers are acceptable at interior partition demolition.
      b. Exception: Small power chisels are acceptable for removal of concrete topping slabs.

2. Do not drill or cut structural supporting elements without specific approval in each case, unless the element is shown on structural drawings to be drilled or cut. Do not cut existing concrete slab reinforcement.

D. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

E. Remove only masonry indicated to be removed, masonry that must be removed to make way for the Work under this Contract, and masonry adjacent to the Work under this Contract that is found damaged or is damaged during the Work under this Contract beyond satisfactory repair.

F. Plaster: Remove only sufficient plaster, lathing, support systems, and other materials and items as is necessary to permit the Work under this Contract.

G. Do not use cutting torches or explosive actuated devices.

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

I. When removing existing finishes, completely remove loose materials and damaged substrate materials. Salvage sound historic fabric materials dislodged by demolition operations. Leave top of exposed substrate completely free from materials that would interfere with bond or proper attachment of new or salvaged materials.

J. Decrease the cutting of joist length as much as possible.

K. When removing existing wood flooring for salvage, protect tongue in tongue and groove floor boards for reinstallation.

L. Salvage items shall be stored and protected from damage from construction and construction-related dust.

M. Remove items to be salvaged with care to retain characteristics needed for reuse.

3.04 CLEANING

A. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

B. Remove materials as demolition progresses. Upon completion of demolition, leave areas in clean condition.
   1. Repair any demolition performed in excess of that which is required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.
   2. Upon completion of work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.
   3. Clean adjacent premises free of dust, dirt and debris caused by selective demolition.

3.05 PATCHING AND REPAIRS

A. Firestop holes in all interior partitions and structure to remain. At Contractor's option, openings in concrete and masonry may be temporarily covered with noncombustible board material and filled with firestopping insulation. Permanent firestopping with appropriate materials shall be accomplished as soon as the penetrating Work is installed.

B. Where repairs to existing surfaces are required, patch with firestopping material to produce surfaces suitable for materials and finishes to be restored.

3.06 SCHEDULE

A. Salvage and store brick by type, size and color.

B. Salvage and store wood joists by depth of joist. Provide inventory of joists to Architect.

C. Salvage wood floor for repairs.

D. Salvage metal ceiling tile for reuse. Extra ceiling tile shall be stored in basement for future use by Owner.

E. Construction operations in areas of historic fabric shall be carefully done so as not to damage historic features to remain.

3.07 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 7000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Prevent damage to historic building materials during the removal of materials scheduled to be demolished.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permit.
   7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

C. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

D. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

E. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

F. When possible, recycle jobsite waste, including demolished finishes:
   1. Lay-in ceilings
   2. Flooring
   3. Carpet

END OF SECTION

SECTION 02 4100
SELECTIVE DEMOLITION FOR CIVIL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Extent of selective demolition work indicated on drawings.
B. Types of Selective Demolition Work: Demolition requires but is not limited to the selective removal and subsequent off-site disposal of the following.
C. Removal of existing asphalt pavement and base material indicated to be removed on the drawings.
D. Removal or temporary relocation of other miscellaneous existing items as required to complete the work as indicated in the construction documents.
E. Removal of concrete curbs and sidewalks.

1.02 SUBMITTALS

A. Schedule: Submit detailed sequence of demolition and removal work to Owner's Representative for review prior to commencement of work, to ensure uninterrupted progress of Owner's on-site operations.

1.03 JOB CONDITIONS

A. Occupancy: Owner and owner's tenants will be continuously occupying areas and buildings immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of normal activities. Provide minimum of 72 hours advance notice to Owner of demolition activities, which will impact normal activities.
B. Condition of Structures: Owner assumes no responsibility for actual condition of items to be removed.
   Note: Conditions existing at time of commencement of contract will be maintained by Owner in so far as practicable. However, variations may occur due to Owner’s operations prior to start of selective demolition work.
C. Protection: Provide temporary barricades and other forms of protection as required to:
   1. Protect Owner's personnel and general public from injury due to selective demolition work.
   2. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from occupied portions on site.
   3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
D. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.
E. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
F. Utility Services: Maintain existing utilities unless indicated to be removed, keep in service, and protect against damage during demolition operations. Note: Do not interrupt existing utilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruption to existing utilities, as reviewed by governing authorities.

PART 2 PRODUCTS

N/A

PART 3 EXECUTION

3.01 SELECTIVE DEMOLITION

A. Inspection: Prior to commencement of selective demolition work, inspect areas in which work will be performed.
B. Locate, identify and temporarily disconnect utility services that are affected by adjacent repairs as necessary. Note: Provide by-pass connections as necessary to maintain continuity of service to other areas of building. Provide minimum of 72 hours advance notice to Owner if shut-down

of service is necessary during change-over.

C. Demolition: Perform selective demolition work for repairs as indicated in the construction documents in a systematic manner and as follows: Note: Saw cut existing asphalt pavement as indicated on plans. All cuts shall be to full depth of new pavement thickness to allow proper installation of new concrete pavement. Cutting shall be performed using motor driven saw designed to cut pavement with clean, sharp, unchipped edges.

D. Pavement removal: shall be performed as required to conform with plans and specifications and to provide conditions for installation of new paving. Note: If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.02 MAINTENANCE

A. Environmental Controls: Use suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

3.03 CLEAN-UP

A. Salvage Items: Where indicated on Drawings as "Salvage-Deliver to Owner", carefully remove indicated items, clean, store and turn over to Owner and obtain receipt.

B. Disposal of Demolished Materials: Remove debris, rubbish and other materials resulting from demolition operations from building site each day. Transport and legally dispose of materials off site. Note: If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution. Burning of removed materials is not permitted on project site.

C. Clean-up: Upon completion of selective demolition work, remove tools, equipment and demolished materials from site. Remove protection and leave areas clean.

END OF SECTION

SECTION 04 0510

MASONRY RESTORATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Select cleaning and removal of heavy biological growth and staining from exterior masonry as indicated.

B. Spot clean interior masonry as indicated:
   1. Remove paint, sealant, and/or plaster residue, dirt, and dust from masonry walls.

C. Finish removal on exterior brick, as indicated.

D. Finish removal on interior masonry, as indicated:
   1. Remove cementitious plaster coating on interior limestone walls.

E. Rebuild and repair masonry as indicated.
   1. Select repair and replacement of damaged limestone units at exterior, as indicated.
   2. Select infill of openings at exterior brick walls, as indicated.

F. Repoint mortar joints as indicated:
   1. 100% repointing of masonry at exterior limestone and brick, and at basement interior masonry walls.

G. Salvaged brick masonry for infill at existing openings, as indicated.

1.02 RELATED SECTIONS

A. Section 01 5000 - Temporary Facilities and Controls: Scaffolding.

B. Section 07 9005 - Joint Sealers.

C. Section 09 9050 - Finish Removal: Plaster and Paint finish removal.

1.03 REFERENCES

A. ASTM C1713 - Standard Specification for Mortars for the Repair of Historic Masonry; 2013.

B. ASTM C1324 - Standard Test Method for Examination and Analysis of Hardened Masonry Mortar; 1996.

C. Hot and Cold Weather Masonry Construction; Masonry Industry Council; 1999.

D. NPS Technical Preservation Services Preservation Brief 1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings; 2000.

E. NPS Technical Preservation Services Preservation Brief 2: Repointing Mortar Joints in Historic Masonry Buildings; 1998.

F. NPS Technical Preservation Services Preservation Brief 6: Dangers of Abrasive Cleaning to Historic Buildings; 1979.

1.04 PERFORMANCE REQUIREMENTS

A. All work shall comply with the United States Secretary of the Interior's Standards for the Treatment of Historic Properties, unless stated otherwise.

B. Chemical or physical cleaning treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of masonry, if needed, shall be undertaken using the gentlest means possible.

C. Masonry repairs and patches shall be indistinguishable from adjacent surfaces at viewing distance of five feet.

D. New brick:
   1. Where use of salvaged brick is not practical or material is declared unacceptable, provide new brick to match existing in lieu of reinstalling removed brick.
   2. Provide new brick as acceptable to Architect.

E. New limestone:

1. Where indicated, provide new limestone that closely matches existing, as acceptable to Architect.

1.05 SUBMITTALS

A. See Section 01 3000 for submittal procedures.

B. Samples: Submit two samples of new brick for infill, showing range of color and texture.

C. Samples: Submit two samples of new limestone for infill, showing range of color and texture.

D. Certificates: Certify that mason experience and training meets or exceeds specified requirements.

E. Manufacturer's Instructions: For cleaning and patching materials, indicate special procedures, conditions requiring special attention, and site mixing procedures.

1.06 QUALITY ASSURANCE

A. Restorer: Masonry contractor with documented expertise in masonry restoration with minimum ten years of experience with historic buildings and which employs technicians with documented training and experience in the required masonry restoration procedures of at least five years.

B. Source of materials: Obtain materials for repointing from a single source for each type of material required to ensure a match in quality, color, and texture.

C. Do not modify intended aesthetic effects, as judged solely by Architect, except with approval of Architect, and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.07 MOCK-UP

A. Exterior Masonry - Limestone: Clean a representative area of heavy biological growth, minimum of 2 foot wide by 1 foot heigh section, to determine efficacy of specific cleaning method.

B. Exterior Masonry - Brick: Remove a representative area of existing paint finish from exterior brick, minimum 2 feet wide by 1 foot heigh section, to determine efficacy of specific paint stripping method.

C. Interior Masonry: Remove a representative sample of existing cementitious plaster coating at interior masonry, where indicated, minimum 2 feet by 2 feet, to determine efficacy of specific removal method without damaging substrate.

D. For each type of masonry indicated, restore and repoint a masonry wall containing representative area sized a minimum of 4 feet long by 4 feet high.
   1. Mortar removal mock-up for existing joints, sized minimum of 2 feet by 2 feet.
   2. Repointing mock-up, sized minimum of 2 feet by 2 feet.
   3. Match color, texture, and tooling of designated existing mortar.

E. For each type of stone repair, illustrate repair procedures as follows:
   1. For repair stone "Dutchman," build one representative wall area, minimum 2 foot by 2 foot, incorporating repointing.

F. For infill at existing openings, build one representative infill wall area, minimum 4 foot by 4 foot, for each type of masonry indicated:
   1. For limestone infill, incorporate example of the range of sizes of new limestone units. New limestone should match existing in appearance, including porosity, color, and tooling marks.
   2. For brick infill, indicate specified bond type, mortar joint type, and mortar color.

G. Approved Mortar Sample: Protect and maintain approved mortar sample until all repointing work is completed and acceptable.
   1. Locate where directed.
   2. Acceptable panel and procedures employed shall become the standard for work of this section.
   3. Mock-up may remain as part of the Work.

1.08 PRE-RESTORATION MEETING

A. Convene one month before starting work of this section.

B. Require attendance of parties directly affecting work of this section.

C. Review conditions of installation, installation procedures, and coordination with related work.

1.09 DELIVERY, STORAGE, AND PROTECTION

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

B. Provide approved patching material pre-mixed in manufacturer's bags, suitable for use with the addition of only water on the job.

C. Storage and Handling: Store masonry components on project site to prevent contact with earth. Handle carefully to avoid chipping and cracking.

1.10 PROJECT CONDITIONS

A. Perform repointing after cleaning masonry surfaces.

B. Perform exterior plaster removal before repointing.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work and cleaning operations.
   1. Cold Weather Requirements: See paragraph 1.03.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.
   1. Hot Weather Requirements: See paragraph 1.03.

C. Protect existing building materials during masonry restoration.

D. Provide proper application/installation of masking materials. Eliminate pin holes or gaps which would allow the cleaner to "get behind" the protective surface and cause damage to exposed areas.

E. Protecting Glass and Metal Surfaces: Protect glass and metal surfaces to prevent "etching" of the surface or oxidation of metallic surfaces, unsightly discoloration of the metal, and rust formation.
   1. Glass and metal surfaces shall be protected from exposure to strong cleaning products with polyethylene film or other proven protective material. Metal and glass surfaces shall be completely covered with the polyethylene and masking tape used to seal off the edges of the polyfilm.
   2. Non-porous surfaces such as glass and metal may also be protected with liquid masking materials at Contractor's option. These materials shall be applied to the surface to be protected and removed after the cleaning operation is completed.
   3. Liquid masking material shall be thoroughly pre-tested for chemical resistance to strong cleaners.

F. Protecting Existing Flooring: Protect existing wood flooring and wood wall base to prevent damage or discoloration.

PART 2 PRODUCTS

2.01 MANUFACTURERS OF RESTORATION PRODUCTS

A. Acceptable Manufacturers of New Brick: the following manufacturers, or approved equal:
   1. ACME Brick; 16121 College Oak Dr., San Antonio, TX 78249; Phone: (210) 493-2616; Fax: (210) 493-2928. Email: rdunn@brick.com; www.brick.com
   2. D'Hanis Brick & Tile Company; 311 E. Nakoma, San Antonio, TX 78216; Phone: (210) 525-8142; Fax: (210) 349-2833; www.dhanisbricktile.com
   3. The Belden Brick Company; P.O. Box 20910, Canton, OH 44701; Phone: (330) 451-2031; Email: info@beldenbrick.com; www.beldencrick.com

B. Acceptable Manufacturer for Masonry Restoration Cleaners and Finish Removers:
   1. Dumond Chemicals, Inc. Phone: (609) 655-770. www.dumondchemical.com

C. Acceptable Manufacturer of Masonry Repair and Stabilization Products:
   1. Cathedral Stone Products, Inc., 7266 Park Circle Drive, Hanover, MA 21076. Phone: (800) 684-0901; Fax: (410) 782-9155. E-mail: info@cathedralstone.com. Website: www.cathedralstone.com
   2. Akemi North America, Inc., distributed by InnoChem LLC. Phone: (770) 409-8789. www.innochemllc.com.

D. Substitutions: See Section 01 6000.

2.02 CLEANING MATERIALS

A. Water: Potable.

B. Non-ferrous, natural-bristle brush.

C. Chemical paint & coating stripper: Low-odor, non-flammable, water-based paint stripper that does not contain N Methyl Pyrrolidone (NMP), suitable for interior use on porous masonry surfaces, such as:
   1. Peel Away 1 Heavy Duty Paint Removal System; Dumond Chemicals, Inc.
   2. Peel Away 4 Cementitious Coating Removal System; Dumond Chemicals, Inc.

2.03 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I, white, buff, gray or combination thereof.
   1. Low-Alkali Cement: Natural or white Portland cement for use with stone shall contain not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S, high plasticity, for Masonry Purposes.
   1. Provide lime with a minimum of 26% magnesium oxide after hydration (dolomitic lime).

C. Aggregate for Mortar: ASTM C 144, unless otherwise indicated.
   1. Colored-Mortar Aggregate: Natural sand selected to produce mortar color indicated.
   2. Match size, texture, and gradation of existing mortar sands as closely as possible.

2.04 MASONRY MATERIALS

A. Brick for infill at existing openings, as indicated on Drawings:
   1. Type: Salvaged, to march existing.
   2. New to match existing

B. Limestone for replacement of damaged units, as indicated on Drawings:
   1. New to match existing
   2. New limestone for replacement and 'Dutchman' repairs should be 'like for like,' matching existing historic stone in chemical and physical characteristics. Use stone that matches existing adjacent sound stone in geological type, compressive strength, density, porosity, texture, and color, as accepted by Architect.

2.05 REPAIR MATERIALS

A. Stone-to-Stone Adhesive: Two part polyester resin stone adhesive with a 15-30 minute cure at 70 degrees F (21 degrees C), in formulation (knife or flowing grade) recommended by adhesive manufacturer for type of stone indicated, as selected by Architect from tinted or standard colors available from adhesive manufacturer.
   1. Acceptable Manufacturers:
      a. Cathedral Stone Products.
      b. Akemi North America.

B. Stone Patching Mortar: JAHN M70 Stone Patching Mortar.
   1. Vapor-permeable single-component mortar.
   2. For restoration of stone surfaces.
   3. Mineral-based, containing no synthetic polymer bonding agents or additives.

4. Laboratory-engineered formulation for compatibility with existing stone substrate and formulated to patch stone surfaces by adjusting the amount of water added at the site.
5. Color: Custom color to match existing stone.

2.06 ACCESSORIES

A. Anchors: Stainless Steel Helical Anchors at dutchman repairs

B. Pneumatic Carving Chisels: Barre Short Stroke Pneumatic Carving tool described herein may be available from Trow & Holden Company, Inc.; Barre, Vermont; ph: 800/451-4349, 802/476-7221.
   1. Type B or D (Dallett) with splitter or cape chisel as follows:
      a. Chisel to have a round shank and be hand held in place in the carving tool with no retainer.
      b. The width of the cutting edge and diameter of any portion of the chisel blade which enters the masonry joint shall not exceed three-quarters of the width of the face thickness of the mortar joint.
      c. Compressor activating the tool shall have a variable pressure control and be regulated to provide air pressure consistent with effective cutting of the mortar.

2.07 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
   1. Mixing Pointing and Repair Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that shall retain its form when pressed into a ball. Maintain mortar in this dampened condition for 1 to 2 hours. Add remaining water in small portions until reaching mortar of the desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

B. Do not use admixtures of any kind in mortar, unless otherwise indicated.

C. Mortar: Produce repointing mortar of color required to match existing mortar by using specified ingredients. Do not alter specified proportions without Architect's approval.

D. Mortar Proportions: Mix mortar materials in the following proportions:
   1. Pointing Mortar for Limestone: ASTM "Type O": 1 part low alkali white portland cement, 2 parts Type S hydrated lime, and 8-9 parts mortar aggregate.
      a. Provide one shade lighter than natural stone and as required to match appearance of historic mortar.
   2. Pointing Mortar for Brick: ASTM "Type O": 1 part low alkali white portland cement, 2 part Type S hydrated lime, and 8-9 parts mortar aggregate.
      a. Match color and consistency of existing mortar.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be restored are ready for work of this section.

3.02 PREPARATION

A. General: Comply with recommendations of manufacturers for protecting building surfaces against damage from exposure to their products.

B. Protect elements surrounding the work of this section from damage and disfigurement.

C. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

3.03 EXTERIOR RESTORATION CLEANING

A. To be carried out ONLY as needed in conjunction with repointing.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Use natural-fiber brushes only.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry surfaces.

C. Removal of heavy biological growth or staining from masonry surfaces shall be undertaken by the gentlest means possible:
   1. Water-only Method:
      a. Wet surface with warm water.
      b. Agitate stained surface with soft fiber brush.
      c. Rinse from the bottom up with potable water applied with low pressure, at a maximum pressure of 300psi and at a rate of 4 gal/min.

D. Paint removal at exterior brick: Peel Away 1 Heavy Duty Paint Removal System, or approval equal.
   1. Manually scrape all loose paint using paint scrapers, or stiff bristle brush.
   2. Apply proprietary chemical paint remover, per manufacturer's instructions.
   3. Allow the stripper to stay on the brick as directed by the manufacturer and as determined by test patches.
   4. Rinse completely with clean, fresh water using low pressure wash to remove all paint and residue.
   5. Apply a second coat of stripper if necessary to remove remaining paint.
   6. Rinse completely and apply afterwash as recommended by manufacturer.
   7. After paint has been removed but before brick dries, apply neutralizer such as white vinegar, or a proprietary chemical neutralizer as recommended by manufacturer. A neutral (7 pH) should be achieved.
   8. Thoroughly rinse the surface with clean, clear water.

3.04 INTERIOR RESTORATION CLEANING

A. Use proper safety equipment for protecting the body, hands, and eyes of the operator. Perform operation of equipment with adequate guidance and supervision of experienced personnel.

B. Protect existing finishes to remain from chemical cleaners and all chemical/water run-off.

C. Use only those cleaning methods indicated for each masonry material and location. Follow manufacturer's instructions.

D. Removal of cementitious coating: Peel Away 4 Cementitious Coating Removal System, or approved equal.
   1. Manually remove as much loose coating as possible, with hand held chisels. Take care not to damage masonry substrate.
   2. Apply proprietary chemical coating remover, per manufacturer's instructions. Apply as many coats of paint remover as necessary to remove coating down to indicated sound substrate. Test substrates periodically and provide a neutralizer chemical in final rinse as required, per manufacturer's instructions.

3.05 MORTAR REMOVAL

A. The object of mortar removal is to remove failed, incongruous and detrimental materials without damaging the stone. Emphasis should be placed on preserving the edges of the stone units.

B. For mortar joints to be repointed, rake out joints as follows:
   1. Rake out mortar from joints to depth not less than 1 1/2 times the width of the joint, nor less than that required to expose sound, un-weathered mortar.
   2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
   3. Do not spall edges of masonry units or widen joints. Replace damaged masonry units.
      a. Cut out old mortar by hand with a chisel and mallet or use approved pneumatic hand held carving chisel. Saw cutting of mortar joints is not permitted.

3.06 MASONRY REPAIR AND REPLACEMENT

A. Cut out damaged and deteriorated units with care in a manner to prevent damage to any adjacent remaining stone.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining mortar to provide firm and solid bearing for new work.

D. Build in replacement units per the following procedures:
   1. Drench units not already thoroughly wet with clear potable water and remove excess water prior to setting.
   2. Set each piece in full bed of mortar (100 percent coverage) with vertical joints and holes in substrate completely filled.
   3. Install built in stone and tile work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

E. Rebuilding stone units with stone 'Dutchmen':
   1. Apply adhesive to comply with adhesive manufacturer's directions. Coat bonding surface of building stone with stone-to-stone adhesive completely filling all voids and covering all surfaces. Fit stone fragments onto building stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured.
   2. Further anchor stone fragments larger than 6" x 6" x 6" in any dimension with 1/4" diameter plain stainless steel rods set into 1/4" diameter holes or, where not feasible, holes drilled perpendicular to plane of break. Center and space anchor rods not more than 5" nor less than 3" apart and not less than 2" from any edge. Insert rods not less than 2" into backing stone and 2" into fragment with end set back 3/4" from exposed face of stone, with holes drilled from inside broken face of stone for concealed anchorage in the finished work. Adhere dowels to stone with polyester adhesive.
   3. Clean any residual adhesive from edges. Wet stone and fill any chipped areas, cracks, and drill holes with specified patching material matching color and texture of stone. Avoid feather edging. Furnish patched areas to match texture of, and be level with, adjoining surrounding stone surfaces. Keep patching mortar damp for 72 hours.

3.07 REPOINTING

A. Cut out loose or disintegrated mortar in joints to minimum 3/4 inch depth or until sound mortar is reached.
   1. Remove all hard, cementitious mortar from existing joints to the greatest extent possible, ensuring minimal damage to existing stone surfaces.

B. Use hand tools only. Do not use power tools.

C. Do not damage masonry units.

D. When mortar removal is complete, remove dust and loose material by brushing.
   1. Remove dust, dirt, grease, laitance and other coatings or foreign substance which might prevent proper adhesion of mortar.
   2. Complete surface preparation by washing surface with clean water, using natural-bristle brush.

E. Completely wet substrate immediately before applying mortar by flushing with clean water.

F. Apply mortar to wet surface, with no pooling water; if surface is allowed to dry out before mortar is applied, repeat wetting.

G. Tool mortar joints, using pointing tools and techniques required to match adjacent existing mortar joints.

H. Pack tightly in maximum 3/8 inch layers: Fully compact each layer and allow to dry to thumbprint hardness before applying next layer.
   1. Where existing mortar has be removed to a depth of greater than 1", these deep areas should be filled first, compacting new mortar in several layers, with minimum 1/4" and maximum 3/4" per layer.

I. When final layer is thumbprint hard, tool to match approved sample joint.
   1. Avoid feather-edging of mortar joint.
   2. Where masonry wall is indicated to receive Plaster, finish joints to ensure proper keying for new plaster.

J. Immediately after repointing, remove excess mortar by light brushing with a natural bristle brush. Do not leave encrusted mortar.

K. Keep joints moist by water-misting several times a day for seventy-two hour period.
   1. Where access to joints is not possible, cover joints temporarily with plastic sheeting; application of plastic sheeting does not alter requirements for normal curing techniques.

3.08 PROTECTION

A. Protect installed Work from subsequent construction operations.

END OF SECTION

SECTION 05 5150

ALUMINUM LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. ALUMINUM ACCESS LADDERS.

B. ALUMINUM SHIP'S LADDERS.

C. ALUMINUM CAGE LADDERS.

1.02 RELATED SECTIONS

A. SECTION 05500 - METAL FABRICATIONS: FASTENERS AND INSTALLATION REQUIREMENTS USED TO ATTACH LADDERS TO STRUCTURE.

B. SECTION 14200 - ELEVATORS: FOR PIT LADDERS.

C. SECTION 15050 - BASIC ELECTRICAL MATERIALS AND METHODS: FOR ELECTRICAL GROUNDING OF LADDERS.

1.03 REFERENCES

A. AA - ALUMINUM ASSOCIATION.

B. ASTM B 209 - STANDARD SPECIFICATION FOR ALUMINUM AND ALUMINUM-ALLOY SHEET AND PLATE.

C. ASTM B 221 - STANDARD SPECIFICATION FOR ALUMINUM AND ALUMINUM-ALLOY EXTRUDED BARS, RODS, WIRE, PROFILES, AND TUBES.

D. OSHA 1910.27 - FIXED LADDERS.

1.04 SUBMITTALS

A. SUBMIT UNDER PROVISIONS OF SECTION 01300.

B. PRODUCT DATA: MANUFACTURER'S DATA SHEETS ON EACH PRODUCT.

C. SHOP DRAWINGS:
   1. DETAIL FABRICATION AND ERECTION OF EACH LADDER INDICATED. INCLUDE PLANS, ELEVATIONS, SECTIONS, AND DETAILS OF METAL FABRICATIONS AND THEIR CONNECTIONS.
   2. PROVIDE TEMPLATES FOR ANCHORS AND BOLTS SPECIFIED FOR INSTALLATION UNDER OTHER SECTIONS.
   3. PROVIDE REACTION LOADS FOR EACH HANGER AND BRACKET.

D. QUALIFICATION DATA:
   1. REFER TO QUALITY ASSURANCE PROVISIONS FOR SUBMITTAL REQUIREMENTS EVIDENCING EXPERIENCE, CERTIFICATIONS AND RESOURCES.

E. SELECTION SAMPLES: FOR EACH FINISH SPECIFIED, TWO COMPLETE SETS OF COLOR CHIPS REPRESENTING MANUFACTURER'S FULL RANGE OF AVAILABLE COLORS.

F. VERIFICATION SAMPLES: FOR EACH FINISH SPECIFIED, TWO SAMPLES, MINIMUM SIZE 6 INCHES (150 MM) SQUARE, REPRESENT ACTUAL PRODUCT COLOR.

1.05 QUALITY ASSURANCE

A. MANUFACTURER QUALIFICATIONS: A FIRM EXPERIENCED IN PRODUCING ALUMINUM METAL LADDERS SIMILAR TO THOSE INDICATED FOR THIS PROJECT.
   1. RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE.
   2. SUFFICIENT PRODUCTION CAPACITY TO PRODUCE REQUIRED UNITS.
   3. PROFESSIONAL ENGINEERING COMPETENT IN DESIGN AND STRUCTURAL ANALYSIS TO FABRICATE LADDERS IN COMPLIANCE WITH INDUSTRY STANDARDS AND LOCAL CODES

B. INSTALLER QUALIFICATIONS: COMPETENT AND EXPERIENCED FIRM CAPABLE OF SELECTING FASTENERS AND INSTALLING LADDERS TO ATTAIN DESIGNED OPERATIONAL AND STRUCTURAL PERFORMANCE.

C. PRODUCT QUALIFICATION: PRODUCT DESIGN SHALL COMPLY WITH OSHA 1910.27 MINIMUM STANDARDS FOR LADDERS.

D. MOCK-UP: PROVIDE A MOCK-UP FOR EVALUATION OF SURFACE PREPARATION TECHNIQUES AND APPLICATION WORKMANSHIP.
   1. INSTALL LADDER IN AREA DESIGNATED BY ARCHITECT.
   2. DO NOT PROCEED WITH REMAINING WORK UNTIL WORKMANSHIP AND INSTALLATION ARE APPROVED BY ARCHITECT.
   3. REWORK MOCK-UP AS REQUIRED TO PRODUCE ACCEPTABLE WORK.

1.06 DELIVERY, STORAGE, AND HANDLING

A. STORE PRODUCTS IN MANUFACTURER'S UNOPENED PACKAGING UNTIL READY FOR INSTALLATION.

1.07 PROJECT CONDITIONS

A. FIELD MEASUREMENTS: VERIFY DIMENSIONS BY FIELD MEASUREMENT BEFORE FABRICATION.
   1. ESTABLISHED DIMENSIONS: WHERE FIELD MEASUREMENTS CANNOT BE MADE WITHOUT DELAYING THE WORK, INDICATE ESTABLISHED DIMENSIONS ON SHOP DRAWING SUBMITTAL AND PROCEED WITH FABRICATION.

1.08 WARRANTY

A. A MANUFACTURER HAS RESPONSIBILITY FOR AN EXTENDED CORRECTIVE PERIOD FOR WORK OF THIS SECTION FOR A PERIOD OF 5 YEARS COMMENCING ON THE SHIPMENT DATE OF THE PRODUCT AGAINST ALL THE CONDITIONS INDICATED BELOW, AND WHEN NOTIFIED IN WRITING FROM OWNER, MANUFACTURER SHALL PROMPTLY AND WITHOUT INCONVENIENCE AND COST TO OWNER CORRECT SAID DEFICIENCIES.
   1. DEFECTS IN MATERIALS AND WORKMANSHIP
   2. DETERIORATION OF MATERIAL AND SURFACE PERFORMANCE BELOW MINIMUM OSHA STANDARDS AS CERTIFIED BY INDEPENDENT THIRD PARTY TESTING LABORATORY. ORDINARY WEAR AND TEAR, UNUSUAL ABUSE OR NEGLECT EXCEPTED.
   3. WITHIN THE WARRANTY PERIOD, THE MANUFACTURER SHALL, AT ITS OPTION, REPAIR, REPLACE, OR REFUND THE PURCHASE PRICE OF DEFECTIVE LADDER.

B. MANUFACTURER SHALL BE NOTIFIED IMMEDIATELY OF DEFECTIVE PRODUCTS, AND BE GIVEN A REASONABLE OPPORTUNITY TO INSPECT THE GOODS PRIOR TO RETURN. MANUFACTURER WILL NOT ASSUME RESPONSIBILITY, OR COMPENSATION, FOR UNAUTHORIZED REPAIRS OR LABOR. MANUFACTURER MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, TO THE MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, DESIGN, SALE, INSTALLATION, OR USE, OF THE LADDER; AND SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES OF OR EXPENSES, RESULTING FROM THE USE OF LADDER PRODUCTS.

1.09 EXTRA MATERIALS

A. FURNISH TOUCHUP KIT FOR EACH TYPE AND COLOR OF PAINT FINISH PROVIDED.

PART 2 PRODUCTS

2.01 BASE BID MANUFACTURER

A. ACCEPTABLE MANUFACTURER: O'KEEFFE'S, INC.; 100 N HILL DRIVE, SUITE 12, BRISBANE, CA 94005. TOLL FREE TEL: (888) 653-3333. TEL: (415) 824-4900. FAX: (415) 824-5900. EMAIL: INFO@OKEEFFES.COM. WEB: WWW.OKEEFFES.COM

B. Other Acceptable Manufacturers:

1. Alaco Ladder Company, 5167 G street, Chino, California 91710-5143. Toll Free 888-310-7040, Tel: 909-591-7561, Fax: 909-591-7565 sales@alacoladder.com
2. Precision Ladders, LLC. 5501 Jeffery Lane, MOrristown, TN 37813. Tel: 800-225-7814 Fax: 423-586-2091

C. Substitutions Permitted.

D. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.02 APPLICATIONS / SCOPE (WHERE APPLICABLE)

A. Fixed and Cage Ladder Design:
1. Safety cages are required on ladders over 24 feet (7315 mm)
2. Safety cages are required on all ladders in high or hazardous areas.
3. Landing platforms are required at 50 feet (15,240 mm) above the bottom of the ladder.
4. Rail and harness fall arrest system as alternate to safety cage and landing platforms shall be a permissible manufacturer's option.
   a. Fixed Ladder Bottom Bracket
   b. Bottom floor supported bracket.
   c. Bottom wall supported bracket.

B. Fixed Access Ladder:
1. Standard Duty Channel Rail.
   a. Model 500 as manufactured by O'Keeffe's Inc.
2. Heavy Duty Tubular Rail.
   a. Model 501 as manufactured by O'Keeffe's Inc.
3. Tubular Rail Low Parapet Access Ladder with Roofover Rail Extension.
   a. Model 502 as manufactured by O'Keeffe's Inc.
4. Tubular Rail Low Parapet Access Ladder with Platform and Return.
   a. Model 503 as manufactured by O'Keeffe's Inc.
5. Tubular Rail Low Parapet Access Ladder with Platform.
   a. Model 503A as manufactured by O'Keeffe's Inc.
6. Tubular Rail Low Parapet Access Ladder with Walk-through Rail Extension.
   a. Model 504 as manufactured by O'Keeffe's Inc.

C. Cage Ladder:
1. Cage Ladder with Roof Hatch Rail Extension.
   a. Model 531 as manufactured by O'Keeffe's Inc.
2. Cage Ladder with Roofover Rail Extension.
   a. Model 532 as manufactured by O'Keeffe's Inc.
3. Cage Ladder with High Parapet Access, Platform and Return.
   a. Model 533 as manufactured by O'Keeffe's Inc.
4. Cage Ladder with High Parapet Access, Platform and No Return.
   a. Model 533A as manufactured by O'Keeffe's Inc.
5. Tubular Rail Low Parapet Cage Ladder with Walk-through Extension.
   a. Model 534 as manufactured by O'Keeffe's Inc.

D. Ship Ladder:
1. Ships Ladder.
   a. Model 520 as manufactured by O'Keeffe's Inc.
2. Ship Ladder with Platform.
   a. Model 521 as manufactured by O'Keeffe's Inc.
3. Ship Ladder with Platform and Return.
   a. Model 522 as manufactured by O'Keeffe's Inc.
4. Ship Ladder with Access to Roof Hatch.
   a. Model 523 as manufactured by O'Keeffe's Inc.
5. Incline:
   a. 60 degree.

b. 75 degree.
c. as drawn.

2.03 FINISHES

A. Mill finish. As extruded.

B. Clear Anodic Finish: AA-M10C22A41 Mechanical finish as fabricated. Architectural Class I, clear coating 0.018 mm or thicker.

2.04 MATERIALS

A. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.

B. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.

2.05 FABRICATION

A. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18–3/8 inches (467mm) long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
1. Rungs shall withstand a 1,500 pound (454 kg) load without deformation or failure.

B. CHANNEL SIDE RAILS: NOT LESS THAN 1/8 INCH (3 MM) WALL THICKNESS BY 3 INCHES (76 MM) WIDE. SELF LOCKING STAINLESS FASTENERS, FULL PENETRATION TIG WELDS AND CLEAN SMOOTH AND BURR- FREE SURFACES.

C. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide. Construction shall be

D. Ship Ladders: Not less than 1-1/4 inches (32mm) high, 4-1/8 inch (105 mm) deep and 2 feet (610 mm) wide; tread spacing shall be 1 foot (305 mm) on center. Handrails shall be aluminum pipe, not less than 1-1/2 inches (38 mm) in diameter with hemispheric end caps.

E. Walk-Through Rail and Roof Rail Extension: Not less than 3 feet 6 inches (1067 mm) above the landing and shall be fitted with deeply serrated, square, tubular grab rails.

F. Landing Platform: 1-1/2 inches (38 mm) or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.

G. Security Doors: Formed 1/8 inch (3 mm) thick aluminum sheet. Security panels shall extend on both sides, perpendicular to the door face, to within 2 inches (51 mm) of the wall. Security door shall be furnished with continuous aluminum piano hinge and heavy duty forged steel locking hasps.

H. Ship Ladder Seismic Bottom Support: Manufacturer’s standard; two isolation bearings per stringer.

I. Ladder Safety Post: Retractable hand hold and tie off.

J. Rail and Harness Fall Arrest System: Supplied where specified as alternate to safety cage and landing platforms, in accordance with OSHA regulation 1910.27; permanently mounted to ladder rungs and complete with necessary components.

K. Safety Cages:
1. FABRICATE LADDER SAFETY CAGES TO COMPLY WITH AUTHORITY HAVING JURISDICTION. ASSEMBLE BY WELDING. SPACING OF PRIMARY HOOPS, SECONDARY HOOPS AND VERTICAL BARS SHALL NOT EXCEED THAT REQUIRED BY CODE.
2. Safety cage hoops and vertical bars: 3/16 inch (5 mm) by 2 inches (51 mm) aluminum bar.

PART 3 EXECUTION

3.01 EXAMINATION

A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.

B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.

C. IF SUPPORTING STRUCTURE IS THE RESPONSIBILITY OF ANOTHER INSTALLER, NOTIFY ARCHITECT OF UNSATISFACTORY SUPPORTING WORK BEFORE PROCEEDING.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction

3.03 3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 05 5220

STAINLESS ROD RAILING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior Guardrails, located at Roof Terrace and Balcony.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, sizes, fabrication, anchorage and installation details, and lengths for railing system on shop drawings prepared by fabricator of railing supporting structure.

C. Samples: Minimum 12 inch (300 mm) length of rod, handrail, and each fitting and accessory proposed for the Project. Submit items in selected finish.

D. Quality Assurance/Control Submittals:
   1. Qualifications: Proof of manufacturer's qualifications.
   2. Manufacturer's Installation Instructions.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
   1. Design shall comply with all applicable code requirements, including minimum requirements of force on guardrail in any direction.

B. Manufacturer Qualifications: Minimum five years experience in producing railing assemblies of the type specified.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Special Warranty: Stainless steel rods and connectors – 10 year limited warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. View Rail, www.viewrail.com.

B. Custom-Fabricated rail system may be an acceptable substitution, as evaluated by Architect.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Stainless Steel Rods:
   1. Material: Ultra-Marine 2205 stainless steel.
   2. Diameter: 3/8" or as required by Manufacturer.
   3. Finish: Brushed.
   4. Spacing: 3 1/8" O.C.
   5. Provide bent steel rods at corners without posts.

B. Railing:
   1. Shape: 1"x2" Rectangular
   2. Material: Ultra-Marine 2205 stainless steel.

3. Finish: Powder coated. Provide samples for finish selection by Architect.
4. Length: Provide maximum uninterrupted lengths as allowed by Manufacturer. Finish field cut ends per Manufacturer's instructions.
5. Attach rail to post per Manufacturer's instructions.

C. Metal Posts:
1. Metal posts at Roof Terrace: Surface Mounted with foot cover
   a. Attach posts per Manufacturer's instructions.
   b. Mount foot plate to framing structure that is 4 1/2" wide or wider.
   c. Density of framing members must be of a density equal to or greater than Southern Yellow Pine (.55).
   d. Each post must have 4 fasteners (5/16" x 4" stainless steel screws) installed to full depth.
   e. Fasteners must fully penetrate without splitting. Pre-drill all holes to avoided splitting the wood.
2. Metal posts at Balcony: Slim Side-Mounted
   a. Attach posts per Manufacturer's instructions.
   b. Each post must have 2 fasteners (5/6" x 4" stainless steel socket head bolts) with rear mounting plate to prevent bolts from pulling through.
   c. Minimum framing material for mounting is double 2x8.
3. Post tops: flat
4. Material: Ultra-Marine 2205 stainless steel.
5. Finish: Powder coated. Provide samples for finish selection by Architect.
6. Spacing: Provide maximum even spacing, with maximum spacing of 4' OC.

D. Fasteners:
1. All fasteners stainless steel.
2. Utilize fasteners in accordance with Manufacturer's instructions.

2.03 ACCESSORIES

A. Accessories: Stainless steel protector sleeves, rubber grommets, bushings, beveled washers and additional accessories as recommended by manufacturer for installation conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine work to which railing assembly will be anchored or will penetrate. Coordinate with responsible entity to perform corrective work as necessary.

B. Verify post size and railing assembly spacing are in accordance with manufacturer’s recommendations.

C. Take field measurements and compare installation conditions to shop drawings. Notify manufacturer if field measurements vary from shop drawings.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Isolate dissimilar metals with grommets or bushings.

C. Clean and seal stainless steel elements in accordance with the Manufacturer's instructions.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 05 7000
DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Railing and guardrail assemblies.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

E. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Schedule and conduct a preinstallation meeting one week before starting work of this section. Attendees shall include, but not be limited to:
   1. Contractor.
   2. Manufacturer's representative.
   3. Architect.
   4. Owner's representative.

1.04 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.

C. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.

D. Samples: Submit one (1) of each item below for each type and condition shown.
   1. Powder coating finish
   2. Fabricated mounting bracket

E. Manufacturer's Installation Instructions.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing decorative railing systems and acceptable to manufacturer.

1.07 MOCK-UP

A. Provide (2) mock-ups of decorative panels, 1'-8-1/2" x 1'-8-1/2" x 1/4", illustrating each type of material, powder coating, and finish.
   1. Coordinate with Architect for mock-up pattern.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufactures provided protective coverings and packaging.

B. Protect materials against damage during transit, delivery, storage, and installation at site.

C. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.

D. Prior to installation, store materials and components under cover, in a dry location.

1.09 WARRANTY

A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Guardrail & Screen
   Eureka Sheet Metal
   550 Delgado St, San Antonio, TX 78207
   Tel: 210.735.4426

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage[, but not less than that required to support structural loads].

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

F. Connections: Fabricate railings with welded connections unless otherwise indicated.

G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   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 flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint

H. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

I. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

J. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

L. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

M. Edge panels with C-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch (1.1 mm) thick.

N. Orient perforated metal with pattern parallel to ground

O.

2.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Railing Panels, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
   2. Infill load and other loads need not be assumed to act concurrently.

2.04 MATERIALS

A. Steel Components:
   1. Sections, Shapes, Plate and Bar: ASTM A36/A36M.
   2. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
   3. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
   4. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
   5. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.05 ACCESSORIES

A. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry for bolting anchors.
   3. For anchorage to stud walls, provide backing plates for bolting anchors.
   4. Exposed Fasteners: No exposed bolts or screws.

B. Carbon Steel Bolts and Nuts: ASTM A307.

C. Finish Touch-Up Materials: As recommended by manufacturer for field application.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's drawings and written instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.

C. Anchor securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

F. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

3.02 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with flanges connected to brackets on underside of rails connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using nonwelded connections.

C. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
   1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt]
   2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets[and railing end flanges] to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.
   3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
   4. For steel-framed partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.03 CLEANING

A. Remove protective film from exposed metal surfaces.

B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

3.04 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
   1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 05 7050
INTERIOR METAL RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall-mounted metal handrails.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

B. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

C. American with Disabilities Act (ADA), Current

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.

C. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.

E. Maintenance Data: Manufacturer's instructions for care and cleaning.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing railing systems and acceptable to manufacturer.

B. Source limitation: Obtain each type of railing through one source from a single manufacturer.

1.06 PERFORMANCE REQUIREMENTS

A. Allow for expansion and contraction of members and building movement without damage to connections or members.

B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails:
      a. Uniform load of 500 lbf/ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in factory provided protective coverings and packaging.

B. Protect materials against damage during transit, delivery, storage, and installation at site.

C. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.

D. Prior to installation, store materials and components under cover, in a dry location.

1.08 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Provide allowance for trimming and fitting at site.

B. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C).

C. Maintain ambient temperature of space at minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C) for 24 hours before, during, and after railing installation.

1.09 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. 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 with time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.10 WARRANTY

A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Metal Railings:
   1. Julius Blum & Co., Inc. www.juliusblum.com
   2. Blumcraft of Pittsburgh / C R Laurence Company. www.crlaurence.com
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS, METAL

A. Metals, General:
   1. Metals Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
   2. Brackets, Flanges, and Anchors: Cast of formed metal of same type of materials and finish as supported rails, unless otherwise indicates.

B. Handrail:
   1. Profile: Julius Blum 6985
   2. Provide continuous slope at landings.

C. Post:
   1. Profile: Julius Blum 326L

D. Spindles
   1. Profile: Julius Blum 739L

E. Handrail wall Bracket:
   1. Profile: Julius Blum 376

2.03 ACCESSORIES

A. Anchors and Fasteners for Anchoring Railings to Other Construction: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry for bolting anchors.
   3. For anchorage to stud walls, provide backing plates for bolting anchors.

B. Anchors: Provide cast-in-place anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

C. Fasteners for Interconnection Railing Components: Provide concealed fasteners for interconnecting railing components, unless otherwise indicated.

D. Carbon Steel Bolts and Nuts: ASTM A307.

E. Non-shrink, Non-metallic Grout: Factory-packaged, nonstaining, noncorrosive, non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Hydraulic Expansion Cement: ASTM C1107/C1107M.

G. Anchoring cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create a pourable anchoring, patching and grouting compound.
   1. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
   1. Provide primers that comply with Division 9 specifications, and which are compatible with finish coatings.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.04 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.

B. Assemble railings in the shop to the greatest extant possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Welded connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

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 flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

H. Non-welded connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

I. Form changes in direction as detailed and by bending to smallest radius that will not result in distortion of railing member.

J. Close exposed ends of railing members with prefabricated end fittings.

K. Provide walls returns at ends of wall-mounted railings, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6mm) or less.

L. Provide wall brackets, flanges and miscellaneous fittings and anchors to interconnect railing members to other work, unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

N. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with steel plate forming bottom closure.

O. Toe boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions as details indicate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate and site conditions are acceptable and ready to receive work.

B. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

C. Verify field dimensions of locations and areas to receive work.

D. Notify Architect immediately of conditions that would prevent satisfactory installation.

E. Do not proceed with work until detrimental conditions have been corrected.

F. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.

3.02 PREPARATION

A. Protect existing work.

B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.

C. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

3.03 INSTALLATION, GENERAL

A. Comply with manufacturer's drawings and written instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.

C. Anchor securely to structure. Adjust railing before anchoring to ensure matching alignment at abutting joints.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

F. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

3.04 RAILING CONNECTIONS

A. Non-welded connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded connections: Use fully welded joints for permanently connection railings components. Comply with requirements for welded connections in Part 2.

3.05 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material in manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material in manufacturer's written instructions.

C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For steel pipe railings, weld flanges to post and bolt metal supporting surfaces.

3.06 ANCHORING RAILING ENDS

A. Anchor railing ends to concrete or masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using mechanical connections.

3.07 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2 inch (38 mm) clearances from inside face of handrail to finishes wall surface.
   1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
   2. Use type of bracket with predrilled hole for exposed bolt anchorage.

B. Locate bracket as indicated or, if not indicated, at spacing required to support the structural loads.

C. Secure wall brackets to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.

3. For steel-framed gypsum board or plaster partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.08 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.09 CLEANING

A. Remove protective film from exposed metal surfaces.

B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

C. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

3.10 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
   1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.
   2. Galvanized surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
   3. Touchup painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheathing.
B. Subflooring.
C. Underlayment.
D. Preservative treated wood materials.
E. Communications and electrical room mounting boards.
F. Concealed wood blocking, nailers, and supports.
G. Salvaged wood joists.
H. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary
B. Section 06 2000 - Finish Carpentry
C. Section 06 2100 - Exposed Wood Ceiling Preservation
D. Section 06 4000 - Architectural Woodwork
E. Section 09 3000 - Tiling

1.03 REFERENCE STANDARDS

A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
C. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010.
D. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2002.
E. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 2002.
F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
G. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2014 (editorially revised 2017).
H. PS 1 - Structural Plywood; 2009.
I. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
J. PS 20 - American Softwood Lumber Standard; 2010.
K. SPIB (GR) - Grading Rules; 2014.
L. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2004, and supplements.
M. WWPA G-5 - Western Lumber Grading Rules; 2011.

1.04 DEFINITIONS

A. Dimensional Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimensions.
B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.

3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

C. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

D. Materials Certificates: For dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

E. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

B. Plywood: Comply with PS 1.

1.07 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.08 PROJECT CONDITIONS

A. Repair, alter, or replace existing work as indicated to comply with applicable portions of these specifications as for new work. Workmanship for existing materials to be repaired or altered, but not otherwise specified, shall conform to similar workmanship existing in or adjacent to area in which alterations are to be made.

B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted, except where salvaged from this building.

C. Provide sustainably harvested wood; see Section 01 6000 - Product Requirements for requirements.

D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Thickness: As indicated on drawings, or if not indicated, as required to match thickness of original sheathing or underlayment material, as applicable.

C. Sizes: Nominal sizes as indicated on drawings, S4S.

D. Moisture Content: S-dry or MC19.

E. Lumber Decking: Match existing thickness, southern yellow pine species, No. 2 grade, equivalent to existing size classification, 19 percent maximum moisture content; equivalent to existing edge profile, single tongue.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.
   3. Preservative treat blocking, furring, and nailers associated with roofing and waterproofing assemblies.

2.03 EXPOSED DIMENSION LUMBER

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Sizes: Nominal sizes as indicated on drawings.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6 (50 by 50 through 50 by 150 mm)):
   1. Species: Western Cedar.
   2. Grade: Clear.

2.04 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: Kiln-dry (15 percent maximum).

C. Surfacing: Rough.

D. Species: Douglas Fir.

E. Grade: No. 2, 2 Common, or Construction.

2.05 CONSTRUCTION PANELS

A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels," Form No. E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Concealed APA Performance-Rated Panels: Where construction panels will be used for concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, exposure durability classification, veneer grade, species, and edge detail.

D. Thickness: As indicated on drawings, or if not indicated, as required to match thickness of original sheathing or underlayment material, as applicable.

E. Subfloor/Underlayment Combination: Any PS 2 type, rated Single Floor.
   1. Bond Classification: Exterior.
   2. Span Rating: 48.
   3. Performance Category: 1-1/8 PERF CAT.
   4. Edges: Square.

F. Underlayment for Ceramic Tile Flooring: APA Underlayment
   1. 1/2 inch (12.5 mm) thick, Exposure 1, plugged face plywood substrate with 1/8" gap between sheet.
      a. Refer to uncoupling membrane manufacturer for underlayment installation guidelines, as specified in Section 09 3000 - Tiling.
   2. 3/4 inch (19mm) thick, tongue and groove plywood substrate with 1/8" gap between sheets.
      a. Refer to uncoupling membrane manufacturer for underlayment installation guidelines, as specified in Section 09 3000 - Tiling.

G. APA Rated Roof Sheathing: Exterior Exposure Class except where indicated to be 'marine' plywood, and as follows:
   1. Span Rating: 24/0

H. Wall Sheathing: Plywood, PS 1, Grade Marine for panels used in wet kitchen assemblies; Exterior Grade elsewhere.

I. Other Applications:
   1. Other Locations: PS 1, A-C Plugged or better.

2.06 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Termite-Resistant Sill Flashing: Self-adhesive membrane; polyethylene film bonded to sealant.
   1. Thickness: 40 mils (0.040 inch) (1 mm).
   2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.

C. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed.

2.07 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber in contact with roofing, flashing, or waterproofing.
      c. Treat lumber in contact with masonry or concrete.
   2. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.

a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws. Nails and staples are not permitted.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.

3.06 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.07 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.08 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 1520

COMPOSITE DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

B. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.03 REFERENCE STANDARDS

A. ASTM D-7032-04: Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails), ASTM International.

B. ASTM D-7031-04: Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products, ASTM International

C. ASTM E-84-01: Test Method for Surface Burning Characteristics of Building Materials, ASTM International.

D. ASTM D 570: Water Absorption of Plastics

E. ASTM D 1761: Mechanical Fasteners in Wood

F. ASTM D -1413-99: Test method for Wood Preservatives by Laboratory Soil-block Cultures

G. ASTM C177: Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

1.04 DESIGN/PERFORMANCE REQUIREMENTS

A. Structural Performance:
   1. Deck: Uniform Load - 100lbf/sq.ft.
   2. Tread of Stairs: Concentrated Load: 750 lbf/sq.ft., and 1/8” max. deflection with a concentrated load of 300 lbf on area of 4 sq. in.

B. Fire-Test Response Characteristics per ASTM E-84.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide Provide product data for specified products indicating compliance with requirements, size Profile and performance characteristics. .

C. Shop Drawings: Indicate Indicate full plans showing deck tiles and deck tile supports layout, adjacent construction and penetrations, and details of each condition of installation and attachment..
   1. Include data indicating compliance with performance requirements.
   2. Indicate points of supporting structure and other construction elements that must coordinate with deck tile installation.

D. Samples: Submit two 2, 1" by 5.5" by 12" inch (25.4 by .140 by 304.8 mm) in size, illustrating For each product specified, when selection is specified..

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

B. Mockups: Build mockup in size and location indicated on Specifications. Demonstrate methods and details of installation.
   1. Approval of mockup does not relieve Contractor of responsibility to comply with all requirements of contract documents.

2. Approved mockup may become part of installation if approved by Architect.

1.07 MOCK-UP

A. Provide Panel mock-up, 8 feet (____ m) long by 4 feet (____ m) wide, illustrating deck tiles and deck tile supports plus edge condition, and framing.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Keep material under cover and elevated above grade until time of installation.

B. Store Store products on a flat and level surface. Adjust support blocks accordingly under cover and elevated above grade.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide 25 year manufacturer warranty against rot, decay, splitting, checking, splintering, fungal damage, and termite damage for a period of 25 years for a residential installation.

PART 2 PRODUCTS

2.01 BASE BID MANUFACTURER

A. Trex Company, Inc 160 Exeter Dr. Winchester, VA 22603 (www.trex.com).
   1. Products:
      a. Transcend 1"x5.5" - Earth Tones -Gravel Path.

B. Other Acceptable Manufacturers:
   1. TimberTech Limited, 894 Prairie Avenue, Wilmington, Ohio 45177 (www.timbertech.com).
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 APPLICATIONS

A. Wood-Plastic Composite Lumber;
   1. Material Description: Composite Decking consisting of recycled Linear Low Density Polyethylene (LLDPE) and recycled wood.
   2. Material Description: Composite plank consisting of high density polyethylene (HDPE) and wood flour, extruded into sizes and shapes indicated with the following physical properties:

2.03 ACCESSORIES

A. Fasteners: Universal Hideaway Hidden Fasteners.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cut, drill, and rout using carbide tipped blades.

C. Do not use composite wood material for structural applications:

D. Pre-drill holes located closer than 1 1/2 inches from ends of plank..

E. Cut ends square..

3.02 CLEANING

A. Clean Clean surfaces regularly with a composite wood/plastic cleaner such as Corte Clean (www.corteclean.com) ..

B. A 1500 psi power washer may be used on Transcend /Enhance/Select shell surface to remove dirt and debris. Use a fan tip at least 4" (10.2 cm) away from the shell when you are using a power washer.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood ceiling preservation.

C. New wood base, chair-rail, and picture-rail, as indicated.

D. Wood shelves from salvaged wood joists, as indicated.

E. Wood door frames, glazed frames.

F. Wood casings and moldings.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 4100 - Cabinets and Casework: Shop fabricated custom cabinet work.

C. Section 09 9000 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

B. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

D. AWMAC (GIS) - Guarantee and Inspection Services Program; current edition at www.awmac.com/gis.php.

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

F. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; 2011.

G. PS 20 - American Softwood Lumber Standard; 2010.

1.04 PERFORMANCE REQUIREMENTS

A. Meet or exceed the minimum requirements specified with respect to surface smoothness and joint tolerances.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on finish material.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
   2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of wood trim 12 inch (304 mm) long.

E. Samples: Submit one sample of salvaged wood for shelving 12 inches long.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

B. Engage the Installer/Fabricator to be retained to perform subsequent restoration work to supervise removal, dismantling and salvage of elements indicated to be reused. Jointly inventory salvaged materials with Installer/Fabricator. Temporarily store materials in a secure place acceptable to Installer/Fabricator.

1. If conditions are encountered which differ from the indicated assumptions regarding typical conditions, immediately notify Architect and do not proceed without further instruction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Inspect the materials upon delivery to assure that specified products have been received.

B. Store materials in safe area, away from construction traffic; store under cover and off ground, protected from moisture.

C. Keep materials clearly separated and identified with grade marks legible. Keep damaged material identified as damaged and stored separately.

D. Protect work from moisture damage and humidity.

1.08 PROJECT CONDITIONS

A. Sequence installation to ensure that woodwork repair and restoration is achieved in an orderly and expeditious manner.

B. Salvage existing wood joists, as indicated on Drawings.

C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

D. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.09 MOCK-UP

A. Provide the following mock-ups for wood shelves made from salvaged wood joists:
   1. One (1) mock-up of finished wood shelves, 2 lineal feet in length, showing polyurethane sealer, no stain finish.
   2. Three (3) mock-ups of finished wood shelves, 2 lineal feet in length, one for each type of stain finish, as selected by Architect.

B. Provide one (1) mock-up of re-finished wood ceiling, minimum 4'x4' area

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:
   1. Picture-rail, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
   2. Bases and Chair-rail: Poplar; prepare for paint finish.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted, except where salvaged from this building.

2.03 LUMBER MATERIALS FOR PAINT FINISH

A. Softwood Lumber: Closed grain species, smooth sawn, maximum moisture content of 6 percent; AWI premium grade for materials quality.

B. Hardwood Lumber: Closed grain species, smooth sawn, maximum moisture content of 6 percent AWI premium grade for material quality.

2.04 ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of douglas fir or pine species.

B. Asphalt-saturated organic felt conforming to the requirements of ASTM D226, type II (No.30).
   1. Provide where wood elements touch concrete or masonry.

C. Primer: Alkyd primer sealer.

D. Wood Filler: Oil base, tinted to match surface finish color.

E. Wood stains and sealers: To be determined by samples, as selected by Architect.
   1. Acceptable manufacturers:
      a. Bona. www.bona.com
      b. Benjamin Moore. www.benjaminmoore.com
      c. Cabot. www.cabotstain.com
      d. Sherwin Williams. www.sherwin-williams.com
      e. Substitutions: See Section 01 6000 - Product Requirements.

2.05 WOOD TREATMENT

A. Back paint (Surface Application): colored, oil base type, equivalent to primers manufactured by entities listed in the referenced interior painting section.

B. Redry wood after pressure treatment to maximum 12 percent moisture content.

2.06 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. When necessary to trim a piece of material which as been back primed, reapply the priming material over the cut area and allow to dry prior to installation.

2.07 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Prime paint surfaces in contact with cementitious materials.

E. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

C. Examine previously installed door frames and verify that they are correct type and installed as required for proper hanging of doors; verify that existing door frames have been properly repaired and are ready to receive new or reinstalled doors. Do not install doors before correcting unsatisfactory conditions.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

D. Replicate existing work as indicated to comply with applicable portion of these specifications as for new work.

3.03 INSTALLATION - BASE, CHAIR-RAIL & PICTURE-RAIL

A. Distribute defects allow in quality grades specified to the best overall advantage. Refer uncertainties to Architect.

B. Install in a single unjointed length for runs less than maximum length of lumber available. For longer runs, use pieces which average a minimum of three feet less than maximum length available.

C. Cope at inside corners and miter at outside corners to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints. Maintain field joint tolerance equal to those specified in AWI Standards for shop prepared joints.

D. Blind nail where possible and use fine finishing nails where exposed. Pre-drill as required to eliminate splitting. Set exposed nailheads and fill flush, matching final finish where transparent finish is indicated.
   1. Install base with double nails at 8 inches on center maximum spacing.

3.04 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

C. Salvaged wood reused for wood shelves: Brush clean wood substrate.

3.05 SITE FINISHING - SALVAGED WOOD

A. Mask off adjacent surfaces before beginning sanding.

B. Sand wood surface using course, medium, and fine sandpaper in sequence, to smooth even finish with no evidence of sander marks. Take precautions to contain dust. Remove dust by vacuum.

C. Apply four finish coats consisting of two coats of specified sealer and two coats of specified finish.

D. Apply first coat, allow to dry, then buff lightly with steel wool to remove irregularities. Vacuum clean and wipe with damp cloth before applying succeeding coat.

E. Lightly buff with steal wool between coats and vacuum clean before applying succeeding coat.

F. Sand wood surface using course, medium, and fine sandpaper in sequence, to smooth even finish with no evidence of sander marks. Take precautions to contain dust. Remove dust by vacuum.

3.06 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.5 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

3.07 CLEANING AND PROTECTION

A. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up and sand only as required to restore damaged, abraded, or soiled areas.
   1. Do not over sand existing original wood.

B. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION

SECTION 06 4100
CABINETS AND CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom cabinet units for Kitchen and Bathrooms.

B. Wood shelving

C. Hardware.

D. Preparation for site finishing

E. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 2000 - Finish Carpentry: Wood shelving from salvaged wood joists.

C. Section 06 4150 - Solid Surface Countertops

D. Section 09 9000 - Painting and Coatings.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, hardware location and schedule of finishes.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet and shelf unit substrate and finish.

E. Samples: Submit two panels, 12 x 12 inch in size, illustrating cabinet finish.

F. Samples: Submit two samples of proposed drawer pulls, hinges, and shelf standards, demonstrating hardware design, quality, and finish.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Premium quality.

B. Manufacturer Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 MOCK-UP

A. Provide mock-up of full size face frame and door for cabinet, including hardware and finish.

B. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

C. Locate where directed.

D. Mock-up may not remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.09 FIELD CONDITIONS

A. During and after installation of cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 INTERIOR CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Wood Cabinets: Custom grade. walnut.

C. Semi-Exposed Surfaces: walnut veneer over plywood.
   1. Exception: Shelving inside cabinets shall be solid walnut.

D. CDX plywood for core.

2.02 EXTERIOR CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Exposed surfaces: IPE shiplap

C. Semi-Exposed Surfaces: IPE.

D. Marine Grade A-A plywood, sanded free from imperfection, rotary cut, kiln dried, with waterproof boil proof phenolic adhesive. Veneer species IPE

2.03 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.04 COUNTERTOPS

A. Quartz and Concrete Countertops as specified in Section 06 4160

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Aluminum Edge Banding: Extruded convex shape; smooth surface finish; self locking serrated tongue; of width to match component thickness; natural mill finish.

C. Fasteners: Size and type to suit application.

D. Concealed Joint Fasteners: Threaded steel.

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as indicated for quality grade specified.

B. Hardware Finish:

C. Shelf Bracket Pegs
   1. 1/4" L-Shaped Shelf Support Bracket
   2. Finish: Satin Nickel or Stainless Steel

D. Cabinet door pulls:
   1. Product: Edgecliff Pull manufactured by Schoolhouse.
   2. Finish: Satin Nickel.
   3. Substitutions: See Section 01 6000 - Product Requirements.

E. Sliding drawer pulls
   1. Product: Ledge Pull manufactured by Schoolhouse
   2. Finish: Satin Nickel.
   3. Substitutions: See Section 01 6000 - Product Requirements.

F. Catches: Touch type.

G. Drawer Slides:
   1. Type: Extension types as indicated.
   2. Mounting: Side mounted.
   3. Stops: Integral type.
   4. Features: Provide self closing/stay closed type.
   5. Manufacturers:
      a. Grass America Inc; Ball Bearing Slide System: www.grassusa.com/#sle.

H. Hinges: European style concealed self-closing type, steel with polished finish.
   1. Manufacturers:
      a. Grass America Inc; TEC Self-Close: www.grassusa.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

I. Soft Close Adapter: Concealed, frame-mounted, screw-adjustable damper ; steel with polished finish.
   1. Manufacturers:
      a. Grass America Inc; Unisoft: www.grassusa.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

J. Lifter System: Concealed; steel with polished finish.
   1. Manufacturers:
      a. Grass America Inc; Kinvaro: www.grassusa.com/#sle.

2.07 SITE FINISHING MATERIALS

A. Stain, Shellac, Varnish, and Finishing Materials: In compliance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.08 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

C. Cap exposed plywood with solid maple endcaps finish edges to match cabinet face.

D. All cabinet doors drawers and shelves to be solid walnut
   1. Walnut laminate on interior on drawers only. Provide center matched panels at each elevation.
   2. Carry figure of cabinet fronts to toe kicks.

E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.09 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified: Opaque finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.05 SCHEDULES

A. See Attached Cabinet hardware schedule.

END OF SECTION

SECTION 06 4160

QUARTZ AND CONCRETE COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quartz Countertops: Templating, fabrication and installation of countertops.

B. Concrete Countertops: Templating, Polishing, fabrication and installation countertops.
   1. Specialty concrete products including the following:
      a. Concrete cleaning and moisture protection.
      b. Concrete patch and repair.
      c. Floor overlays.
      d. Wall overlays.
      e. Concrete casting.
      f. Casting accessories.
      g. Casting sealers.
      h. Stamped concrete.
      i. Stains.
      j. Exterior concrete paints.
      k. Interior colored resinous flooring.
      l. Exterior clear sealers.
      m. Interior clear coatings.
      n. Resinous and sealer accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

B. Section 06 4100: Cabinets and Casework.

1.03 REFERENCE STANDARDS

A. ASTM C 97: Standard Test Methods for Absorption ad Bulk Specific Gravity of Dimension Stone.

B. ASTM C 170: Standard Test Method for Compressive Strength of Dimension Stone

C. ASTM C 501: Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by Taber Abraser.

D. ASTM C 834: Standard Specification for Latex Sealants

E. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.

F. ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

G. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

H. UL 2818: GREENGUARD Certification Program for Chemical Emissions for Building Materials, Finishes, and Furnishings.

I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

K. AASHTO T259 - Standard Method of Test for Resistance of Concrete to Chloride Ion Penetration.

L. ANSI A118.4 - Specifications for Latex Portland Cement Mortar.

M. AASHTO T260 - Standard Method of Test for Sampling and Testing for Chloride Ion In Concrete and Concrete Raw Materials.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Quartz Product Data: Provide For countertop materials..
   1. Submit data for each specified product. Include manufacturer's technical data sheets and published installation instructions.
   2. Submit Safety Data Sheets (SDS) for adhesives and sealants.

C. Concrete Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.

D. Shop Drawings: For countertops. Submit dimensioned shop drawings showing countertop layouts, joinery, edge conditions, terminations, substrate construction, cutouts, and holes.
   1. Show locations and details of joints.
   2. Show direction of directional pattern, if any.
   3. Show plumbing installation provisions.

E. Samples for Verification: For the following products:
   1. Quartz Countertop material, 6 inches (150 mm) square.
   2. Concrete Countertop Provide three 6 inch x 6 inch samples of sealed concrete with integral color admixture in White Water, Birch, and uncolored.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of five years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer.

B. Quartz Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least [Five] years of documented experience.

C. Concrete Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least Five years of documented experience.

D. Concrete fully engineered to comply with appropriate ACI 318 guidelines.

E. Source Limitations: Obtain primary materials including primers, patching agents, resins, hardening agents, colorants, and top coats from single source from single manufacturer.

F. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques, aesthetic effects and application workmanship.
   1. Finish areas designated by Architect.
   2. Construct at least one month before start of work.
   3. Mock-Up shall be on site in areas designated by architect.
   4. Retain samples of all materials used in each mock-up for comparison purposes.
   5. Do not proceed with work prior to receipt of written acceptance of mock-up.
   6. Approved mock-up may remain part of finished work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's recommendations for shipping and handling quartz surfacing materials to preclude breakage and damage. Brace quartz surfacing units as necessary during shipment, transporting in near-vertical position with finished face towards finished face. Do not allow finished surfaces to rub during shipping and handling.

B. Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by the manufacturer. Store quartz surfacing sheet materials on racks in near-vertical position to preclude damage. Store with finished face turned towards finished face. Prevent warpage and breakage

C. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

D. Handling: Handle materials to avoid damage.

1.07 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops and openings by field measurements after base cabinets are installed but before countertop fabrication is complete. Show recorded measurements on shop drawings.

B. Adhesives: Acclimate adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F (24 deg C).

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 PRODUCTS

2.01 QUARTZ COUNTERTOP MANUFACTURERS

A. Wilsonart.

2.02 COUNTERTOP SCHEDULE

A. North Unit
   1. Rooms: 210, 205, 207
   2. Product: Wilsonart - Quartz
   3. Color and Pattern: Q4031 - Dessert Wind
   4. Thickness: 3cm at countertops and waterfall edge

B. South Unit
   1. Rooms: 214, 218
   2. Product: Wilsonart - Quartz
   3. Color and Pattern: Q1018 - Lazio
   4. Thickness: 3cm at countertops and waterfall edge

C. Verify product selection through Sample Submittal approval

2.03 QUARTZ COUNTERTOP FABRICATION

A. General: Fabricate components in shop, to greatest extent practicable, in sizes and shapes indicated according to approved shop drawings and Wilsonart Quartz Fabrication manual.

B. Joint Seams: Form joint seams between quartz surfacing components with specified seam adhesive. Completed joints inconspicuous in appearance and without voids. Provide joint reinforced if required by manufacturer for particular installation conditions.

C. Cutouts and Holes: Provide holes and cutouts for service fixtures and similar countertop-mounted items as indicated. Form cutouts to required template or pattern, with smooth, even curves and eased edges.

D. Countertops: 1.18-inch- thick, quartz with a waterfall edge.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

F. Joints: Fabricate countertops without joints.

2.04 QUARTZ INSTALLATION MATERIALS

A. Joint Adhesive: Methacrylate-based adhesive for chemically bonding quartz surfacing seams. Color complementary to quartz surfacing sheet material. UL 2818 GREENGUARD Gold certified and complying with SCAQMD Rule 1168.
   1. Basis-of-Design Product: Wilsonart Hard Surface Adhesive.

B. Elastomeric Sealant: Mildew-resistant silicone sealant for filling gaps between countertops and terminating substrates in wet environment applications. Complies with ASTM C920, Type S (single component), Grade NS (nonsag).
   1. Basis-of-Design Product: Wilsonart; Color Matched Caulk.

C. Siliconized Acrylic Sealant: Siliconized acrylic latex sealant. For general applications to fill gaps between countertops and at terminating substrates. Complies with ASTM C 384, Type OP, Grade NF, and SCAQMD Rule 1168.
   1. Basis-of-Design Product: Wilsonart; Color Matched Caulk.

D. Construction Adhesive: Countertop manufacturer's recommended silicone-based construction adhesive for waterfall edge and other applications according to manufacturer's published fabrication instructions.

2.05 CONCRETE COUNTERTOP SYSTEM MANUFACTURER

A. Basis of Design Manufacturer: SureCrete Design Products, which is located at: 15246 Citrus Country Dr.; Dade City, FL 33523; Toll Free Tel: 800-544-8488; Tel: 352-567-7973; Fax: 352-521-0973; Email: specs@surecretedesign.com; Web: www.surecretedesign.com

2.06 CONCRETE COUNTERTOP SYSTEM MATERIALS

A. Integral color: XS True Color
   1. Mix one XS Color Pack per gallon of XS Modifier.

B. Joint Sealant: Mildew-resistant silicone sealant, clear.

C. Concrete Countertop Sealer: Food Safe Matte Finishes XS-327™, by SureCrete
   1. Substitutions: See Section 01 6000 - Product Requirements.

D. Concrete Countertops Mix Pourable Casting Blend XS-Precast™, by SureCrete
   1. Substitutions: See Section 01 6000 - Product Requirements.

2.07 CONCRETE COUNTERTOP FABRICATION

A. Provide three 6 inch x 6 inch samples of concrete in White Water, Birch, and uncolored for selection by architect before starting fabrication.

B. Concrete Countertops: Precast concrete; top and edges formed against melamine-finished mold; jointing as indicated on drawings; sanded and polished.
   1. Dimensions: As indicated on drawings.
   2. Sealer: High gloss transparent acrylic.
   3. Follow concrete mix manufacturer's recommendations for molding, mixing, placing, and curing.
   4. Construct forms with required inserts and knock-outs and support to remain in place through curing.
   5. Concrete Mix: Non-shrinking, machine-mixed commercial grade concrete mix for casting countertops, requiring only the addition of water.
   6. Fabricate a reverse mold form from smooth Melamine panels apply smooth facing tape at all joints
   7. Cast into level form

2.08 MATERIALS

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops. Substrates must be sound, flat, smooth, and free from dust or other surface contaminants.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 QUARTZ COUNTERTOP AND VANITY INSTALLATION

A. Install quartz surfacing components plumb, level, and true according to approved shop drawings and manufacturer's published installation instructions. Use woodworking and specialized fabrication tools acceptable to the manufacturer.

1. Fasten quartz surfacing components to base cabinets or other supporting substrates with suitable adhesives acceptable to manufacturer.

B. Form joint seams with specified seam adhesive. Seams to be inconspicuous in completed work. Seams in locations shown on approved shop drawings and acceptable to manufacturer. Promptly remove excess adhesive.
   1. Clamp or brace quartz surfaces in position until adhesive sets.

C. Fill gaps between countertop and terminating substrates with specified silicone sealant.

D. Install waterfall edge where indicated on Drawings. Adhere to countertops with specified construction adhesive

E. Vanities: Secure front panels to solid substrate with specified construction adhesive.

F. Remove and replace quartz surfacing components that are damaged.

3.03 CONCRETE COUNTERTOP INSTALLATION

A. Fabricate tops and waterfall edge in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide waterfall edge wherever counter edge abuts vertical surface and also unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.

3.04 QUARTZ CLEANING

A. Clean quartz surfacing components according to manufacturer's published maintenance instructions.

B. Completely remove excess adhesives and sealants from finished surfaces.

C. Protect completed work from damage during remainder of construction period.

3.05 CONCRETE CLEANING AND MOISTURE PROTECTION

A. Surface Profiler:
   1. Basis of Design: SCR (Super Concrete Renovator) as manufactured by SureCrete Design Products.

B. Densifier:
   1. Basis of design Product: LD 1800 - Industrial Strength Concrete Lithium Densifier as manufactured by SureCrete Design Products.
      a. Solids: Approximately 15%.
      b. Flash Point: N.A.
      c. V.O.C.: 0 lb per gallon.

C. Basis of Design: Concrete Waterproofing/Crack Prevention:
   1. Product: Elasto-Shield as manufactured by SureCrete Design Products.
      a. Type: Waterborne single component.
      b. Elongation ASTM D-638: 7-day dry 580%. 7-day dry / 21 day wet 657%.
      c. Cracks or voids in excess of 1/8 inch (3 mm) shall be treated independently prior to application of membrane.

D. Surface Retarder:
   1. Basis of Design Product: Retarder as manufactured by SureCrete Design Products.
      a. Type: Safe non-hazardous, water borne retarder

E. Primer:

1. Basis of Design Product: SurePrime - Premium Concrete Surface Bonding Adhesion Agent as manufactured by SureCrete Design Products.
    a. Type: Copolymer emulsion (vinyl acetate ethylene or VAE).
    b. Solids: 28%.
    c. Viscosity: 1,200 cps.
    d. pH: 5.8.
    e. Density: 8.7 lbs/gal (1,044 g/L).
    f. Mechanical Stability: Excellent.
    g. Water Resistance: Good.
    h. Film Clarity: Hazy.

F. Citrus based Degreaser:
1. Basis of Design Product: SureCrete SureClean as manufactured by SureCrete Design Products.

G. Glue/Mastic Stripper:
1. Basis of Design Product: Enviro-Strip as manufactured by SureCrete Design Products.
    a. Type: Non-flammable, water-based stripper for acrylic coating or deeply embedded greasy soil removal on concrete floors.

H. Floor Stripper:
1. Basis of Design Product: SureCrete Fast - Strip Plus as manufactured by SureCrete Design Products.
    a. Type: Solvent based heavy duty stripper

3.06 CONCRETE PATCH AND REPAIR

A. Crack Repair:
1. Basis of Design Product: SCT-22 - Professional Concrete Crack Repair Fast Cure Urethane as manufactured by SureCrete Design Products.
2. Type: Rapid set, technologically advanced, high strength, ultra-low viscosity urethane treatment material.
3. Tensile Strength (ASTM D412): 4600 psi.
4. Elongation (ASTM D412): 6-8%.
5. Compressive Strength (ASTM C10): 4800 psi (with sand), 3900 psi (neat).
6. Bond Strength (ASTM 882): 3450 psi.
7. Pot Life: Approximately. 3 minutes.

3.07 CONCRETE CASTING

A. Dual Component Precast Concrete Countertop Mix:
1. Basis of Design Product: XS Precast - Pourable Concrete Countertop and Furniture Casting Mix as manufactured by SureCrete Design Products.
    a. Density: 126.1 lb/ft^3 (2,018 kg/m^3).
    b. Compressive Strength (ASTM C-109): 3 day - 9,800 PSI (67,569 kPa), 7 day - 10,540 PSI (72,671 kPa), 28 day - 10,730 PSI (73,981 kPa).
    c. Flexural Strength (ASTM C-348): 3 day - 610 PSI (4,206 kPa), 7 day - 635 PSI (4,378 kPa), 28 day - 690 PSI (4,757 kPa).
    d. Tensile Strength (ASTM C190): 3 day - 505 PSI (3,482 kPa), 7 day - 545 PSI (3,758 kPa), 28 day - 550 PSI (3,792 kPa).

3.08 CONCRETE CASTING ACCESSORIES

A. Concrete Casting Tint:
1. Basis of Design Product: XS Color Packs - Concentrated Pigment Concrete Casting Color as manufactured by SureCrete Design Products.
    a. Type; Pure, synthetic, iron oxide pigments that are UV stable and contain no fillers.
    b. Color: As scheduled, to be selected by Architect.

B. Forming System:

1. Basis of Design Product: XS Forming System - Polystyrene Foam Rails and Tapes for Casting Concrete as manufactured by SureCrete Design Products.

C. Concrete Surface Filler:
   1. Basis of design Product: XS Slurry - Casting Concrete Slurry Pin Hole Filler as manufactured by SureCrete Design Products.
      a. Density: 126.1 pounds/ft^3 (2018kg/m^3).
      b. Compressive Strength (ASTM C-109): 28 day 4278 PSI (29495 kPa).
      c. Flexural Strength (ASTM C-348): 28 day 995 PSI (6860 kPa).
      d. Tensile Strength (ASTM C-190): 28 day 440 PSI (3033 kPa).
      e. Abrasion Resistance (ASTM D-4060): 28 days <.50%.
      f. Mosaic Shear (ANSI A-118.4): 28 day 280 PSI (1930 kPa).

D. UV Stable Water Based Concrete Stain:
   1. Basis of Design Product: Eco-Stain by SureCrete Design Products.
      a. Type: Zero VOC, UV stable, water based penetrating concrete stain.
      b. Application: Interior and exterior cement based floors, walls, ceilings, countertops, wall panels, and other architectural elements in both residential and commercial settings.
      c. Color: As selected by Architect from manufacturer's colors. Multiple colors in varying dilution rates to match Architect's sample.

3.09 CONCRETE SEALERS

A. Surface Preparation: Surface shall be dry and clean of dust, dirt, oils, and other surface contaminants. Provide surface profiling on concrete deck surfaces that are smooth, hard and dense per manufacturer's recommendations.
   1. Provide chemical profiling with products compatible and manufactured by sealer manufacturer.

B. Coverage Verification:
   1. Coverage is dependent upon porosity of substrate. Provide RILEM and similar test to verify application to achieve stated product performance. Adjust application, coverage and methods to comply with manufacturer's product specifications.

C. Application: Apply when air and surface temperatures are between 60 degree F (16 degrees C) and 90 degree F (32 degrees C) with relative humidity below 85 percent during application and cure time. High humidity (above 75 percent) will slow cure rates and affect gloss. Substrate shall be a minimum of 5 degrees above dew point.

D. Abrasive Agent: Broadcast between coats of sealer on a deck surface at coverage rate recommended by manufacturer.

E. Abrasive Additive: Mix into the sealer and apply. Contractor option to broadcast additive between coats of sealer on a deck surface where multi-coat application is scheduled or required.

F. Countertop Sealer:
   1. Basis of Design Product: XS-327 - Professional Grade Food Safe Countertop Sealer as manufactured by SureCrete Design Products.
      a. Type: Two component, moisture-cure, high solids hybrid water based polyurethane coating.
      b. Application: Food safe upon curing. Stain resistant to most household chemicals and culinary items. Heat resistant to 300 degrees F (149 degrees C).
      c. Sheen: To be determined by Architect
         1) Test Performance:
            (a) Appearance (cured): Clear matte or gloss
            (b) Water Resistance: Excellent, beads water.
            (c) Mechanical Stability: Excellent.
            (d) Light Stability: Excellent.

(e) Solids: 64% as packaged.
(f) Appearance (wet): Milky.
(g) Odor: Sweet.
(h) Application Temperature: 60 degrees F - 90 degrees F (16 degrees C - 32 degrees C).
(i) VOC Content: 25 g/L before dilution.
(j) Pot Life: Approximately 30 minutes.
(k) Gardener: Direct / reverse impact >160 inch pounds.
(l) Taber Abrasion: 40-60 mg loss.
(m) QUV - A: <5.0 @ 2000 hours.
(n) Gloss Retention: >95% @ 2000 hours.

2) Chemical Resistance Industrial Chemicals (24 hours exposure).
(a) MEK (methyl ethyl ketone): No effect.
(b) Xylene: No effect.
(c) Tap Water: No effect.
(d) Mineral Spirits: No effect.
(e) 100% Ethanol: No effect.
(f) 10% Acetic Acid: No effect.
(g) 5% Sodium Hydroxide: No effect.
(h) 50% Sodium Hydroxide: No effect.
(i) 85% Lactic Acid: No effect.
(j) 50% Sulfuric Acid: No effect.
(k) 38% Hydrochloric Acid: No effect.
(l) 10% Sodium Chloride Solution: No effect.
(m) 28% Ammonia: No effect.

3) Chemical Resistance Household Chemicals: (24 hours exposure)
(a) Coffee: No effect.
(b) Cola: No effect.
(c) Grape Juice: No effect.
(d) Ketchup: No effect.
(e) Mustard transient staining
(f) Clorox Bleach 5 - 10%: No effect.

END OF SECTION

SECTION 07 0150

PREPARATION FOR REROOFING AND DECK REPAIR

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Vacuuming and disposing all loose gravel from existing gravel surfaced roofs to be reroofed.
   2. Removal and disposal of existing multi-ply asphalt built-up roof membrane and all flashings down to roof deck.
   3. Deck repair at damaged areas and unused openings.

1.02 RELATED WORK

A. Section 01 3233 - Photographic Documentation

B. Section 02 4100 - Demolition

C. Section 06 1050 - Rough Carpentry

D. Section 07 2000 - Roof and Deck Insulation

E. Section 07 5422 - Thermoplastic Membrane Roofing-- PVC

F. Section 07 6000 - Flashing and Sheet Metal

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.04 SEQUENCING AND SCHEDULING

A. Sequence and schedule work to accommodate Owner's use of premises.

1.05 EXISTING CONDITIONS

A. Conduct demolition to minimize interference with adjacent roofing, roof-mounted equipment, and roof deck and structure to remain, except as noted on Drawings.

B. Provide, erect, and maintain temporary barriers and security devices.

C. Conduct operations with minimum interference to public or private thoroughfares. Maintain egress and access at all times.

D. Do not close or obstruct roadways or sidewalks without Owner's written consent.

E. Coordinate with Owner to locate abandoned/unused rooftop equipment and penetrations within scope of Work. Remove and dispose all abandoned/unused rooftop equipment and penetrations, repair deck per Contract Documents.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wood decking: Pressure treated KDAT 19% nominal 1”x6” wood plank decking, match existing profile.

B. Sheet metal shall be 22 gauge galvanized sheet metal; size to cover openings an additional four inches on each side for unused penetration openings less than 12 inches in diameter or 12” square. For larger openings, install decking to match the existing wood deck.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that areas to be demolished are clear of encumbrances.

B. Beginning of demolition means acceptance of existing conditions.

C. Obtain and review the AISD record of asbestos containing materials prior to performing any demolition of existing roof related materials. Refer any requirements for the abatement of asbestos containing material to the AISD Project Manager.

3.02 PREPARATION

A. Protect existing landscaping materials, appurtenances, structures, paving, roofing and siding, roof mounted equipment, roof deck and structure, which are not to be demolished.

B. Provide temporary plywood walkways for protection of roof surfaces that are used to transport material or workers, whether the roof surfaces are existing or new, within the roofing scope or not. Secure plywood walkways to prevent wind uplift. Protect piping, expansion joints, areas dividers, and other encumbrances in walkway paths with ramps.

C. Coordinate with Owner to shut down air intake equipment in the vicinity of the Work. Cover air intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors.

D. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

E. Maintain roof drainage components in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drainage components. Verify roof drainage components are properly operating at end of each workday, when no work is taking place, or when rain is forecast.
   1. If roof drainage components will be temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under new membrane roofing system.

F. Verify that rooftop utilities and service piping have been shut off before commencing Work.

3.03 EXECUTION

A. Remove only as much existing roof area as can be made watertight by the end of the work period.

B. Remove all fasteners from deck.

C. Evenly cut edges of existing materials that are to be expanded, replaced, or modified.

D. Cease operations and notify Owner immediately if adjacent structures or materials appear to be endangered. Do not resume operations until corrective measures have been taken.

E. If deck surface is not suitable for receiving new roofing, or if structural integrity of deck is suspect, immediately notify Architect, Roof Consultant and Owner. Do not proceed with installation until directed by Owner.

F. Remove materials to be re-installed or retained by Owner in a manner to prevent damage.

G. Keep work sprinkled to minimize dust. Provide hoses and water main or hydrant connections for this purpose. Do not allow water to pond or saturate the deck.

H. Remove demolished materials from the roof as the work progresses. Overnight rooftop storage of demolished materials is prohibited. Keep all grounds adjacent to roofs within the Scope of Work free of roofing debris at all times. Leave site in clean condition.

I. Stop demolition work and notify the Owner and Roof Consultant immediately if suspected hazardous or unknown materials are encountered.

J. Exercise care in demolition work to prevent damage to interior finishes.

END OF SECTION

SECTION 07 1300

SELF-ADHESIVE AIR AND WATER BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High-temperature, Self Adhesive Air and Water Barrier

1.02 RELATED SECTIONS

A. Section 06 1219 - Structural Insulated Panels

B. Section 07 4623 - Wood Siding

C. Section 07 6200 - Sheet Metal Flashing and Trim

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

B. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.04 SUBMITTALS

A. Refer to Owner’s General Conditions and Special Conditions, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in roof waterproofing sheet membranes with three years experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 60 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY

A. Correct defective Work within a 5 year period after Date of Substantial Completion.

B. Provide 5 year manufacturer material warranty for waterproofing failing to resist penetration of water and failing to adhere to substrate .

C. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.01 MEMBRANE MATERIALS

A. Modified Bituminous Membrane: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, surfaced and reinforced with non woven polyester; 40-mil thick self-adhering sheet with release liner on adhesive side
   1. Formulated for seaming by self adhesion.
   2. Comply with ASTM D 1970 Standard for Steep Roof Underlayment.
   3. Comply with ASTM D 1970 Standard for High Temperature Roof Underlayment.
   4. Tensile Strength: 620 psi minimum ASTM D 412.
   5. Ultimate Elongation: At least 125 percent, measured in accordance with ASTM D 412.
   6. Adhesion to Plywood: 9 lb/in (528 N/M) ASTM D 903.

B. Membrane Sealant: As recommended by membrane manufacturer.

2.02 ACCESSORIES

A. Flexible Flashings: Type recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.

D. Overlap edges and ends, minimum 3 inches (76 mm), seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

F. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

G. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 6 inches (150 mm) above horizontal surface for first ply and 6 inches at subsequent plies laid in shingle fashion.

H. Seal membrane and flashings to adjoining surfaces.

3.04 FIELD QUALITY CONTROL

A. Inspection by Manufacturer's Representative:

1. Inspect finished surface preparation, application, and finished waterproofing and require further preparation or application to achieve appropriate result.

B. Owner may provide testing and inspection services. Contractor shall provide temporary construction and materials for such testing.

3.05 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation for filling cavities as required for acoustical purposes.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

2.02 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.

B. Manufacturers:
   1. CertainTeed Corporation; _____: www.certainteed.com/#sle.
   2. Johns Manville; _____: www.jm.com/#sle.
   3. Owens Corning Corp: www.owenscorning.com.
   4. Thermafiber,Inc. : www.thermafiber.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

B. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

C. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches (150 mm) on center. Lap and seal sheet retarder joints over member face.

F. Tape seal tears or cuts in vapor retarder.

G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.03 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2200
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Flat stock and tapered polyisocyanurate insulation board, tapered crickets, saddles and sumps.

B. Insulation coverboard.

1.02 RELATED WORK

A. Section 06 1050 - Rough Carpentry

B. Section 07 0150 - Preparation for Reroofing

C. Section 07 5422 - Thermoplastic Membrane Roofing-- PVC

D. Section 07 6000 - Flashing and Sheet Metal

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures

B. Submit manufacturer's installation instructions, samples and product data.

C. Submit fastening pattern per deck type, include field, perimeter and corner patterns.

D. Submit two full size samples of each insulation board type and thickness.

E. Submit certification from roof membrane manufacturer that board insulation materials are acceptable for use with roof membrane materials.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable local building codes for roof assembly requirements.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver and store products in accordance with the provisions of Division 1.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 1.

B. Coordinate the work of installing roof membrane and flashing as the work of this Section proceeds.

PART 2 - PRODUCTS

2.01 INSULATION BOARD

A. Flat stock and tapered polyisocyanurate insulation, ASTM C1289, closed cell foam core bonded to fiberglass facers, 1/4” and ½” per foot slope, thickness as shown in Drawings; maximum thickness of 2” per layer; 4’x4’ maximum board dimension.

2.02 COVERBOARD

A. 1/2” DensDeck Prime, Securock, or pre-approved equivalent.

2.03 FASTENERS

A. Fasteners: factory-coated steel fasteners with pre-assembled metal plates meeting corrosion-resistance provisions in FMG 4470, from primary roofing materials manufacturer, or approved equivalent, length as required to penetrate existing deck ¾” minimum.

2.04 ADHESIVE

A. Two-component low-rise polyurethane adhesive that is solvent free and VOC free, and contains no harmful HCFC or CFCs, as approved by the insulation and membrane manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare existing substrate to receive new roofing in accordance with Section 07 0150.

B. Clean deck. If necessary, repair deteriorated or non-serviceable decking in accordance with Section 070150. Seal penetrations to prevent debris from entering building.

3.02 INSTALLATION

A. Verify and document in Daily Report that the existing deck/substrate is functional, substrate is intact, and repairs have been made.

B. Install new polyisocyanurate insulation board in maximum 2” thick layers to provide required R-value on clean and prepared deck.

C. Install new ½” coverboard as required to achieve a complete and proper substrate for the roof membrane system and associated crickets, saddles, and taper to provide complete drainage of stormwater.

D. Tapered crickets between roof drainage components: install 1/2” per foot tapered crickets between all primary roof drainage components and along the up-slope side of all curbed penetrations wider than 12” perpendicular to the roof slope.

E. Mechanically fasten first polyisocyanurate to existing wood deck per ASCE 7 wind uplift requirements and FM Data Sheet 1-29, in accordance with the following:
   1. Field: FM 1-60
   2. Perimeters: FM 1-60
   3. Corners: FM 1-90

F. Adhere ½” coverboard to polyisocyanurate insulation board per ASCE 7 wind uplift requirements and FM Data Sheet 1-29, in accordance with the following:
   1. Field: FM 1-60
   2. Perimeters: FM 1-60
   3. Corners: FM 1-90

G. If substrate conditions prevent the specified system from achieving minimum slope indicated on drawings, Contractor shall add additional tapered insulation to achieve the minimum slope.

H. Stagger end joints in adjacent boards. Stagger successive layers in both vertical and horizontal directions. Minimum horizontal stagger is 2-feet; minimum vertical stagger is 12-inches.

I. Butt edges for snug contact. Repair voids greater than ¼” wide by filling with like material.

END OF SECTION

SECTION 07 5422

THERMOPLASTIC MEMBRANE ROOFING - PVC

PART 1 - GENERAL

1.01 DESCRIPTION

A. 80-mil reinforced PVC roof membrane and flashings, fully adhered, all roof membrane seams heat welded.

B. Roof system shall meet the minimum requirements for the City of San Antonio current, applicable building codes, meet requirements of a UL Class A Fire Rated Assembly, the City of San Antonio Energy Conservation Code roofing requirements, and qualify for roof membrane manufacturer's 20-Year No Dollar Limit (NDL) Roof System Guarantee.

1.02 EXTENT OF WORK

A. Provide all labor, material, tools, equipment, and supervision necessary to complete the installation of the specified roof system, including flashings and insulation as specified and as indicated on the Drawings in accordance with the manufacturer's most current specifications and details.

B. Contractor shall be fully knowledgeable of all requirements of the Contract Documents and shall be fully aware of all existing job site conditions that will affect their work prior to commencing with the Work.

1.03 SUBMITTALS

A. Prior to starting work, the Contractor must submit the following in accordance with Section 013000 Administrative Requirements:
   1. Shop drawings of details that differ from those shown in the Drawings, indicating details of construction and identification of materials.
   2. Sample of the manufacturer's 20-Year NDL Membrane System Warranty, and copy of the Application for Warranty.
   3. Copy of Project Information Notice submitted to manufacturer.
   4. Letter of project-specific certification from the manufacturer, listing all layers of the new roofing assembly with required number of fasteners to achieve the specified uplift requirements.
   5. Letter of contractor certification from the manufacturer, which certifies the Contractor is authorized to install the manufacturer's 20-Year No Dollar Limit Guaranteed Roof Systems, with the date of original certification and a list of Contractor personnel who have received training from the manufacturer along with the dates training was received.
   6. Membrane Certification from the membrane manufacturer indicating the membrane thickness over the reinforcing scrim (top ply membrane thickness) is nominal .036" (36-mil).
   7. Certification of the manufacturer's warranty reserve.
   8. Copies of all Permits required by the City of San Antonio or other applicable governmental jurisdiction, or a notarized letter stating that no permits are required.
   9. Upon completion of the installed work, submit:
      a. Copies of the manufacturer's final inspection to the Roof Consultant prior to the issuance of the manufacturer's warranty.
      b. Certificates of Occupancy or "Green Tags" from the applicable governmental jurisdiction, if Permits are required.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.

B. No overnight rooftop storage will be permitted.

C. Store all rolled goods and curable materials in lockable weathertight storage containers.

D. Store curable materials (adhesives and sealants) between 60 degrees F and 80 degrees F in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to 60 degrees F minimum temperature before using.

E. Store materials containing solvents in dry, well-ventilated spaces with proper fire and safety precautions. Keep lids on tight. Use before expiration of their shelf life.

F. Any materials which are found to be damaged shall be removed and replaced at the applicator's expense.

1.05 WORK SEQUENCE

A. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections of the membrane system.

B. Do not disrupt activities in occupied spaces.

1.06 EXISTING CONDITIONS

A. If discrepancies are discovered between the existing conditions and those noted in the Contract Documents, immediately notify Architect by phone and solicit the manufacturer's approval prior to commencing with the Work. Necessary steps shall be taken to make the building watertight until the discrepancies are resolved.

1.07 JOB SITE PROTECTION

A. Do not overload any portion of the building, either by use of or placement of equipment, temporary storage of debris, or storage of materials.

B. Protect against fire and flame spread. Maintain proper and adequate fire extinguishers.

C. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day's work and clean drains.

1.08 WORKMANSHIP

A. Applicators installing new roof, flashing and related work shall be factory trained and approved by the manufacturer they are representing.

B. All work shall be of highest quality and in strict accordance with the manufacturer's published specifications and to the Architects satisfaction.

C. There shall be a qualified, non-working English speaking supervisor on the job site at all times while work is in progress.

1.09 QUALITY ASSURANCE

A. Unless otherwise noted in this specification, the Contractor must strictly comply with the manufacturer's current specifications and details.

B. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer.

C. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified.

D. Provide at least one thoroughly trained and experienced, non-working, English speaking superintendent on the job at all times that Work of this Contract is in progress.

E. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the Roof Consultant and Owner. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the Roof Consultant's consideration.

F. Before commencement of the roof construction, the Contractor shall arrange for inspections to be made by a non-sales technical representative of the membrane manufacturer, as follows:

1. On the first day of roof membrane installation,
2. A minimum of three (3) interim inspections,
3. A final inspection in order to determine whether corrective work will be required before the warranty will be issued.
4. Provide copies of the membrane manufacturer's inspection reports to the Owner and Consultant.
5. Pre-installation Conference: Conduct conference at Project site.
    a. Meet with Architect, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
    b. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
    c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    d. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
    e. Review structural loading limitations of roof deck during and after roofing.
    f. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
    g. Review governing regulations and requirements for insurance and certificates if applicable.
    h. Review temporary protection requirements for roofing system during and after installation.
    i. Review roof observation and repair procedures after roofing installation.

1.10 JOB CONDITIONS, CAUTIONS AND WARNINGS

A. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.

B. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

C. When loading materials onto the roof, take care not to overload the roof structure. Do not overload or damage the building structure.

D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.

E. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.

F. Provide protection for all roof areas exposed to traffic during construction. Protection shall consist of ¾" insulation board underneath 5/8" plywood. Do not allow plywood to contact new roof membrane.

G. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

H. New roofing shall be complete and weather tight at the end of the workday.

I. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.11 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.
   1. Corner Uplift Pressure: 90 lbf/sq. ft.
   2. Perimeter Uplift Pressure: 60 lbf/sq. ft.
   3. Field-of-Roof Uplift Pressure: 60 lbf/sq. ft.
   4. Hail Resistance: SH

PART 2 - PRODUCTS

2.01 GENERAL

A. All components of the specified roofing system shall be products of pre-bid approved manufacturers or accepted by manufacturers the as compatible.

B. All products (including insulation, fasteners, fastening plates and edgings) must be manufactured and supplied by the roofing system manufacturer and covered by the warranty. Any products required by the Project not manufactured by the roofing system manufacturer shall be approved for use, in writing, by the roofing systems manufacturer.

2.02 MEMBRANE

A. 80 mil (+/- 2 mils) thick, white, reinforced PVC membrane, with protective membrane surface coating to resist accumulation of air borne contaminants such as dust and dirt. Membrane thickness over the reinforcing scrim shall be minimum 0.036” (36 mils). Minimum solar reflectance of 0.70, and minimum Solar Reflectivity Index (SRI) of 78.

B. PVC Sheet: ASTM D 4434, Type II, Grade 1, fiber reinforced.
   1. Manufacturers:
      a. Sarnafil (G410 Energysmart roof membrane).
      b. Pre-proposal approved equivalent.
   2. PVC Sheet: ASTM D 4434, Type III, fabric reinforced.
      a. Manufacturers:
         1) Carlisle (Sureflex PVC Kee roof membrane).
         2) GAF (Evergard PVC 80 mil membrane).
         3) Johns Manville (JM PVC 80).

2.03 ADHESIVES AND CLEANERS

A. All products shall be furnished by the pre-bid approved manufacturer and specifically formulated for the intended purpose.
   1. Bonding Adhesive.
   2. Edge Sealant: Cut Edge Sealant.
   3. Sealer: Water Cut-Off Mastic and Sealant.
   4. Pocket Sealant: Molded Pocket Sealant.
   5. Cleaner: Weathered Membrane Cleaner.

2.04 FASTENERS AND PLATES

A. Membrane Fasteners: An oversized diameter (.315”) non-corrosive steel threaded fastener used in conjunction with heavy-duty plates for membrane securement into steel deck as required.

B. Term Bar Nail-Ins: A 1-1/4” long expansion anchor with a zinc plated steel drive pin used for fastening the Termination Bar or Seam Fastening Plates to concrete, brick, or block walls.

2.05 METAL EDGING AND MEMBRANE TERMINATIONS

A. Termination Bar: A 1-inch wide and .098 inch thick extruded aluminum bar pre-punched 6 inches on center; incorporates a sealant ledge to support Lap Sealant and provide increased stability for membrane terminations.

PART 3 - EXECUTION

3.01 GENERAL

A. Inspect the deck and verify it’s preparation to provide an acceptable surface for the installation of the membrane system.

B. Comply with the manufacturer's published instructions for the installation of the membrane roofing system including proper substrate preparation, jobsite considerations and weather restrictions.

C. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking water.

3.02 MEMBRANE PLACEMENT AND ATTACHMENT

A. Unroll and position membrane without stretching. Allow membrane to relax 15 minutes if temperature is above 55 degrees Fahrenheit, allow to relax 30 minutes is temperature is below 55 degrees Fahrenheit. Provide and secure both perimeter and field membrane sheets in accordance with the manufacturer's most current specifications and details.

B. Position membrane over the acceptable substrate. Fold membrane sheet back lengthwise (onto itself) so half the underside of the membrane is exposed.

C. Apply bonding adhesive in accordance with the manufacturer's published instructions, to the exposed underside of the membrane and the corresponding substrate area. Do not apply Bonding Adhesive along the splice edge of the membrane to be hot air welded over the adjoining sheet. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
   1. Roll the coated membrane into the coated substrate while avoiding wrinkles. Roll the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a 150 lb., 24” diameter roller to achieve maximum contact.
   2. Fold back the un-bonded half of the sheet lengthwise and repeat the bonding procedures.
   3. Position adjoining sheets to allow a minimum overlap of 2 inches.
   4. Clean laps with manufacturer’s membrane cleaner prior to hot air welding.
   5. Hot air weld all membrane sheet laps in accordance with the manufacturer's hot air welding procedures.
   6. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously, in accordance with the manufacturer's specifications.

3.03 MEMBRANE SPLICING/HOT AIR WELDING PROCEDURES

A. Hot air weld the membrane using an Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's specifications. At all splice intersections, roll the seam with a silicone roller prior to membrane seam cooling. Hot air weld non-reinforced flashing over splice intersection.

B. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes). Include name of person performing daily probing and evidence that probing was performed in Contractor’s Daily Report.

C. Repair all seam deficiencies the same day they are discovered.

D. Apply Cut Edge Sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete.

3.04 FLASHING

A. Flashing of parapets, curbs, expansion joints and other parts of the roof must be performed using reinforced membrane. Non-reinforced membrane can be used for flashing pipe penetrations, scuppers, as well as inside and outside corners when the use of pre-fabricated accessories is not feasible.

B. Follow manufacturer's required flashing procedures for all wall, curb, and penetration flashing including metal edge, coping and roof drain applications as required to meet manufacturer’s 20-Year No Dollar Limit Guarantee.

3.05 PIPE SUPPORTS

A. Support small rooftop pipes with an engineered prefabricated supports designed for installation without roof penetrations or other features to damage the roof system.

B. Acceptable Manufacturer: PHP Systems and Design, Portable Pipe Hangers, www.portablepipehangers.com

C. Adhere membrane protection pads to base of pipe supports.

3.06 DAILY SEAL

A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

B. Complete an acceptable membrane seal in accordance with the manufacturer's requirements.

3.07 CLEAN UP

A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

END OF SECTION

SECTION 07 6000
FLASHING AND SHEET METAL

PART I - GENERAL

1.01 WORK INCLUDED

A. Install flashing and sheet metal as indicated on Drawings and in these specifications as required for a complete and proper installation. The following items are included:
   1. Parapet wall coping cap.
   2. Through-wall primary and overflow scuppers.
   3. Conductor heads, gutters and downspouts.
   4. Rooftop pipe supports.
   5. Curb flashing for pipe penetrations.
   6. Sheet metal counterflashing.
   7. Termination bars.
   8. Roof mounted mechanical equipment flashing.
   9. Square to round sheet metal flashing for vent stacks.

1.02 RELATED WORK

A. Section 06 1000 - Rough Carpentry

B. Section 07 2200 - Roof And Deck Insulation

C. Section 07 5422 - Thermoplastic Membrane Roofing-- PVC

1.03 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 013000.

B. Describe material profile, jointing pattern, jointing details, fastening methods, and installation details.

C. Submit samples under provisions of Section 013300.

D. Provide full sized sample of metal flashing and post supports illustrating typical seam, external corner, internal corner, material, and finish.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA and NRCA standard details and requirement.

1.05 QUALIFICATIONS

A. Company specializing in sheet metal flashing work with a minimum of 10-years documented experience.

1.06 STORAGE AND HANDLING

A. Stack pre-formed materials to prevent twisting, bending, or abrasion, and to provide ventilation.

B. Prevent contact with materials during storage that may cause discoloration, staining, or damage.

C. Deliver materials to the job site in the manufacturer’s original, unopened packages and containers bearing manufacturer’s name and label.

1.07 WARRANTY

A. Sheet metal work and accessories to be included in Two-Year Contractor’s Warranty, Section 017836.

B. Provide pre-finished metal manufacturer’s twenty-year coating guarantee.

C. Provide pre-finished metal manufacturer’s twenty-year galvanized steel guarantee.

PART 2 - PRODUCTS

2.01 SHEET METALS

A. Sheet metal flashing not exposed to public view: 24 gauge galvanized steel.

B. Sheet metal flashing exposed to public view: Pre-finished 24 gauge galvanized steel, Kynar 500.

C. Sheet metal flashing embedded into roof membrane system: roof membrane manufacturer's 24 gauge galvanized steel, PVC coated to provide a surface acceptable for heat welding roof membrane and flashing.

2.02 SHEET METAL COMPONENTS

A. Counterflashing: 24 gauge galvanized steel.

B. Perimeter Edge Flashing, Expansion Joint Covers, Coping, Conductor heads, Gutters, and Downspouts: Pre-finished 24 gauge galvanized steel.

C. Two-piece fascia extension is required whenever fascia vertical height exceeds 8 inches.

D. Downspout Hangers: Minimum 1/8-inch by 1-inch galvanized steel.

E. Cover Plates, End Caps and Miscellaneous Sheet Metal: Same materials, gauge and profile as edge metal or expansion joint material.

F. Cleats: 22 gauge galvanized steel.

G. Pipe Penetration Curb Rain Hoods: Minimum 24 gauge galvanized steel.

H. Termination Bar: 1/8-inch by 1-inch galvanized bar with pre-drilled holes minimum 8-inches on center.

2.03 ACCESSORIES

A. Solder: ANSI/ASTM B 32 50/50 type.

B. Blind Pop-Rivets: Stainless steel.

C. Elastomeric Membrane: 30 mil-thick PVC vinyl water barrier.

D. Clamping Collar: Stainless steel of size necessary to fit over vent or pipe circumference, as applicable.

2.04 SEALANT

A. Type I: Application exposures to sunlight, ASTM C-920-87, Federal Specification TT-S-00230-C one component gun-grade polyurethane sealant suitable for continuous immersion and resistant to asphalt products.

B. Type II: Applications not exposed to sunlight, butyl rubber based.

C. Hot vent sealant: One-component neutral moisture curing silicone sealant.

2.05 SCHEDULE OF FASTENERS

A. Exposed fasteners: Shall be non-ferrous stainless steel with stainless steel bonded neoprene or EPDM washers.

B. Fasteners shall be compatible to all materials to which they come in contact.

C. Cleat, Counter-flashing, and Surface Fastened Components.
   1. Wood Substrate: No. 10 stainless steel wood screws with stainless steel bonded neoprene washers of length necessary to penetrate wood substrate one inch.
   2. Metal Substrate: Minimum No. 10 stainless steel sheet metal screws or as necessary to suit application with stainless steel bonded neoprene washers.

2.06 FABRICATION

A. Form sections to match existing profiles, true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate continuous cleats and starter strips of same material as sheet, inter-lockable with sheet.

C. Form pieces in longest practical lengths.

D. Hem exposed edges of metal 1/2-inch; miter and seam corners.

E. Form materials with cover plate seam.

F. Fasten and seal metal joints.

G. Fabricate corners from one piece with minimum 18-inch and maximum 36-inch long legs; fasten for rigidity, seal with sealant.

H. Fabricate vertical faces with bottom edge formed outward 1/4-inch and hemmed to form drip.

I. Form edge metal/fascia as existing profiles as specified herein and as shown on Drawings.

J. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

K. Enlarge holes for fastening counter flashing, coping, and pressure bars as necessary to allow for thermal expansion and contraction. Cover exposed holes with appropriate washers.

L. All fabrication and installation of sheet metal shall be in accordance with the latest published SMACNA and NRCA guidelines and recognized roofing and sheet metal industry standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, and cant strips in place, and nailing strips located.

B. Verify membrane termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Field measure site conditions prior to fabricating work.

B. Tie-ins or contact with dissimilar metals: Install separation layer of elastomeric membrane between metal surfaces.

3.03 INSTALLATION - GENERAL

A. Provide flashings of materials indicated on Drawings at all junctures of the roof with perimeters, curbs, mechanical, electrical equipment, etc., that a completely watertight installation is achieved.

B. Fabricate and install sheet metal work with lines, arises and angles sharp and true, and plane surfaces free from warps and buckles. Bead or return all exposed edges. Tin metal for full area of contact on soldered seams and joints. Do soldering slowly with well heated coppers, thoroughly heating seams and completely filling them with solder.

C. Apply bed of roof membrane manufacturer’s water block mastic directly below sheet metal that is set over roofing membrane or in other areas as required by the Drawings, and the manufacturer's specifications.

D. Submit details not covered in Drawings for approval by Owner or Roof Consultant.

E. Install starter and edge strips, and cleats before starting installation.

F. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations approved by Roof Consultant.

G. Lock and seal all joints.

H. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

I. Fasten sheet metal with approved fasteners at a minimum of 12 inches on centers unless otherwise specified in these Specifications or the Drawings.

3.04 PARAPET COPING CAP INSTALLATION

A. Fabricate and install these flashings according to the latest published SMACNA and NRCA guidelines and in accordance with recognized roofing and sheet metal industry standards.

B. All horizontal joints shall have a 1” standing seam as shown in the Drawings.

C. Vertical flanges shall have a minimum height of three (3) inches. High side (outside) shall be cleated continuously; roof side mechanically fastened as shown in the Drawings. All fasteners shall be stainless steel and shall only be fastened in masonry joints.

D. All corners shall be shop mitered, and all shall not be more than two feet beyond a corner in either direction.

3.05 TWO-PIECE COUNTERFLASHING INSTALLATION

A. Secure counterflashing receiver over base flashing to substrate with appropriate fasteners. Secure counterflashing to receiver with stainless steel screws with bonded neoprene washers spaced 12-inches on centers.

B. Pop-rivet and solder all seams.

3.06 CLEAT INSTALLATION

A. Install cleats for edge/coping flashing with appropriate fasteners on eight-inch centers. Fasten cleats only in existing mortar joints with specified mortar fasteners.

3.07 METAL EDGE FLASHING INSTALLATION

A. Install edge flashing in a uniform application of membrane manufacturer’s water block mastic over roof membrane.

B. Apply sealant, Type I, under cover plates at all joints prior to installation.

C. Fasten horizontal flange in a staggered pattern on three-inch centers.

D. Strip-in edge flashing as specified in membrane roofing sections.

3.08 PIPE PENETRATION FLASHING

A. Pipe penetrations shall be through raised wood curbs with a minimum height of 12” above the plane of the finished roof, in accordance with Drawings.

B. Install sheet metal cap in accordance with Drawings.

3.09 PLUMBING VENT SLEEVE

A. Install manufacturer provided plumbing vent sleeves in accordance with manufacturer’s installation instructions. Field fabricated plumbing vent sleeves are prohibited.

B. Install top of sleeve in bed of water block mastic and wrap top of sleeve with stainless steel clamping ring. Seal the top of the clamping ring with manufacturer’s sealant.

3.10 CLEANING

A. Remove all stains and markings from exposed sheet metal.

END OF SECTION

SECTION 07 7123
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

B. Precast concrete splash pads.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MATERIALS

2.02 COMPONENTS

A. Gutters: CDA square style profile.

B. Downspouts: CDA Square profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.

D. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers.

2.03 ACCESSORIES

A. Downspout Boots: Steel.

2.04 FABRICATION

A. Fabricate with required connection pieces.

B. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

C. Hem exposed edges of metal.

D. Fabricate gutter and downspout accessories; seal watertight.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Set splash pans under downspouts.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Curbs.

B. Roof penetrations mounting curbs.

C. Roof hatches, manual and automatic operation, including smoke vents.

D. Roof walkways and platforms.

1.02 RELATED REQUIREMENTS

A. Section 06 1520 - Composite Wood Decking

B. Section 07 7123 - Manufactured Gutters and Downspouts.

C. Section 14 2600 - Limited Use Limited Application Elevator

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   2. Sheet Metal Material:
      a. Aluminum: 0.080 inch (2.03 mm) minimum thickness, with 3003 alloy, and H14 temper.
   3. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
      a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch (152 mm) clearance between curb and metal roof panel flange allowing water to properly flow past curb.
      b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.

c. Maintain at least 12 inch (305 mm) clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.

4. Provide layouts and configurations indicated on drawings.

2.02 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION

A. Roof Hatch Manufacturers:

B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
1. Material: Mill finished aluminum, 11 gage, 0.0907 inch (2.3 mm) thick.
2. Insulation: Manufacturer's standard; 1 inch (25 mm) rigid glass fiber, located on outside face of curb.
3. Curb Height: 12 inches (305 mm) from finished surface of roof, minimum.

D. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 08 8000 - Glazing: Glazing sealants and accessories.

B. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.02 REFERENCE STANDARDS

A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2015a.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

C. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver to manufacturer sufficient samples for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
   6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

E. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.
   2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.

F. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   4. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

G. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

B. Type 1 - Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Type 2 - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.02 JOINT SEALANTS - GENERAL

2.03 NONSAG JOINT SEALANTS

A. Type 3 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.

B. Type 3 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.

2.04 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Overlay Extrusion for Glazing System Joint Protection: Rubber profiled extrusions placed over joints in glazing system and provided with watertight seal.
   1. Profile: As required to match existing metal glazing cap requirements.

C. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

D. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

E. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.03 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet (30 linear m), notify Architect immediately.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.04 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 08 0671
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule of door hardware sets for swinging, sliding, and Raydoors as indicated on drawings.

B. Hardware for wood, hollow metal, and Ray Doors.

C. Hardware for fire-rated doors.

D. Thresholds.

E. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 1416 - Wood Doors and Frames.

1.03 REFERENCE STANDARDS

A. BHMA A156.18 - American National Standard for Materials and Finishes; 2016.

B. BHMA A156.1 - American National Standard for Butts and Hinges; 2016.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

E. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

F. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

G. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

H. DHI (H&S) - Sequence and Format for the Hardware Schedule; 1996.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Only manufacturers listed in Door Hardware Schedule or Section 08 7100 are considered acceptable, unless noted otherwise.

B. Obtain each type of door hardware as indicated from a single manufacturer and single supplier.

C. Manufacturer's Abbreviations:
   1. BDWN - Baldwin
   2. NGP - National Guard Products.
   3. VD - Von Duprin.

D. Other Abbreviations:

AUTO CLS - Automatic closure.
AR - As Required.
DBT - Deadbolt
DDB - Duranodic dark bronze
HNDL - Handel
INTG - Integrated
ORB - Oil Rubbed Bronze
PANIC HWR - Panic Hardware
PKT DR LK - Pocket Door Lock (Privacy)

THMB TRN - Thumb turn.
TOP TRK SLD - Slide Top Track Slide
WTHR STRP - Weather Stripping.

2.02 FINISHES

A. Finishes: Complying with BHMA A156.18.
1. Oil Rubbed bronze.

PART 3 EXECUTION

3.01 DOOR HARDWARE SCHEDULE

A. Organize listing of door hardware components within each hardware set in compliance with 10-Part scheduling sequence indicated in DHI (H&S), unless otherwise indicated.

B. See attached Hardware schedule

BWN = BALDWIN	PMK = PEMKO
IVE = IVES	NGP = NATIONAL GUARD PRODUCTS
SCHG = SCHLAGE	LK = LOCK
LCN = LCN	FAL = FALCON
HAG = HAGER	RAY = RAYDOOR

HW1: ENTRANCE DOOR (101A, 102A

EACH TO HAVE:

1	EA	ENTRY SET	MODEL #: ELA01.150.ENTR	056	BWN
2	EA	LEVER		OWNER SELECTED	
056	BWN				
1	EQ	SURFACE CLOSER	4040XP		689
LCN					
4	EA	HINGE		BB2098 4.5 X 4.5	
	US15	HAG			
1	SET	SEALS	9850C OR 2525C (AS REQD BY MFG)		
NGP					
1	EA	MORTISE	ENTRANCE HDF09 2.5” BACKSET	056	BWN
1	EA	KICKPLATE	8400 10” X 34” LDW		630
IVE					
1	EA	DRIP CAP	16SS-FRAME WIDTH PLUS 4” (AS REQD)		NGP
1	EA	DOOR SWEEP	200NSS-LENGTH AS REQD		NGP
1	EA	FLOOR STOP	FS18S/FS18L (AS REQUIRED)	BLK	IVE
1	EA	EXIT SIGN	EDGE LIT BATTRY BACKUP	RED	
1	EA	TEMP CONST CORE AS REQUIRED			630
1	EA	PERM CORE	AS REQUIRED		630
1	EA	KICKPLATE	8400 10” X 34” LDW		630
IVE					
1	EA	DRIP CAP	16SS-FRAME WIDTH + 4” (AS REQ)		NGP
1	EA	THRESHOLD		PEMKO 253X4_FG	
A	PMK				

*PRIOR TO ORDERING HARDWARE, CONFIRM ALL SELECTIONS MEET REQUIREMENTS FOR NARROW STILE DOORS.

HW2: EXIT DOOR (101B, 105)

1	EA	SURFACE CLOSER	4040XP	689	LCN
4	EA	HINGE	BB2098 4.5 X 4.5	US15	HAG
1	EA	PANIC HRDWR	F-XX-M	630	FAL
1	EA	TRIM	VANGUARD 820 NL	630	FAL
1	EA	CYLINDER	AS REQUIRED	689	
1	EQ	SURFACE CLOSER	4040XP	689	LCN
1	EA	SCRTY FLR STOP	FS18S/FS18L (AS REQUIRED)	BLK	IVE
1	SET	SEALS	9850C OR 2525C (AS REQD BY MFG)		NGP
1	EA	DOOR SWEEP	200NSS-LENGTH AS REQD		NGP
EXIT SIGN					
1	EA	TEMP CONST CORE	AS REQUIRED	630	
1	EA	PERM CORE	AS REQUIRED	630	
1	EA	KICKPLATE	8400 10” X 34” LDW	630	IVE
1	EA	DRIP CAP	16SS-FRAME WIDTH + 4” (AS REQ)	NGP	
1	EA	THRESHOLD	PEMKO 253X4_FG	A	PMK

HW3 RESIDENTIAL ENTRY (103 A)

1	EA	WALL MOUNT KEYPAD/CARD READER MTK 15		GRY	SCHG
1	EQ	SURFACE CLOSER	4040XP	689	LCN
3	EA	HINGE	BB1191 4.5 X 4.5	US15	HAG
1	EA	ELECT. HINGE	ETW-6-1828 BB1191 4.5 X 4.5	US15	HAG
1	EA	ELEC. MORT. LK	6051		BWN
1	EA	DOOR SWEEP	200NSS-LENGTH AS REQD		NGP
1	SET	SEALS	9850C OR 2525C (AS REQD BY MFG)		NGP
1	EA	KICKPLATE	8400 10” X 34” LDW	630	IVE
1	EA	DRIP CAP	16SS-FRAME WIDTH PLUS 4” (WHERE REQD)		NGP
2	EA	LEVER	TBD	056	BWN
1	EA	ENTRY SET	MODEL #: ELA01.150.ENTR	056	BWN
1	EA	TEMP CORE	AS REQUIRED	630	
1	EA	PERM CORE	AS REQUIRED	630	
1	EA	THRESHOLD	AS REQUIRED	630	
1	EA	DOOR STOP	BR7008 DOOR BUMPER	150	BWN

HW4 FRENCH DOOR (203)

1	SET	SEALS	9850C OR 2525C (AS REQD BY MFG)		NGP
6	EA	HINGE	BB1191 4.5 X 4.5	US15	HAG
1	EA	FLUSH BOLT	0600.150	056	BWN

1	EA	DUMMY SET	6974.150.FD	056	BWN
1	EA	PRIV SET	MODEL #: ELA01.150.PRIV	056	BWN
1	EA	MORTISE	HDF19 2.5”BACKSET	056	BWN
4	EA	LEVER	TBD	056	BWN
2	EA	DOOR SWEEP	200NSS-LENGTH AS REQD		NGP
2	EA	DOOR HOLDER	MODEL #: 4105.150	150	BWN
1	EA	DRIP CAP	16SS-FRAME WIDTH PLUS 4” (WHERE REQD)		NGP
3	EA	SILENCER	SR64	GRY	IVE
1	EA	THRESHOLD	AS REQUIRED	630	

HW5 POCKET DOOR PRIVACY (204,205,207B,214A,214B)

1	EA	POCKET DOOR	KIT BY DOOR MANUFACTURER		
1	EA	POCKET DOOR TRIM	PD005.056.PRIV	056	BWN
1	EA	POCKET STRIKE/PULL	MODEL #: 8603.056	056	BWN

*REFER TO MANUFACTURER FOR BACKSET ON DOORS 214A & 214B

HW6 POCKET DOOR PASSAGE (208)

1	EA	POCKET DOOR	KIT BY DOOR MANUFACTURER		
1	EA	POCKET DOOR TRIM	PD005.056.PASS	056	BWN
1	EA	POCKETPULL	MODEL #: 8601.056	056	BWN

HW7: BASEMENT STOREROOM DOORS (003, 004, 007, 008)

3	EA	HINGE	BB1191 4.5 X 4.5	626	HAG
1	EA	MORTISE	STR RM HDF21.056 2.5” BACKSET	056	BWN
1	EA	ENTRY SET	MODEL #: ELA01.150.ENTR	056	BWN
1	EA	SCRTY FLR STOP	FS18S/FS18L (AS REQUIRED)	BLK	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	KICKPLATE	8400 10” X 34” LDW	630	IVE
2	EA	LEVER	TBD	056	BWN
1	EQ	SURFACE CLSR	4040XP	17LCN	

HW8 PRIVACY SWINGING (206, 207A)

3	EA	HINGE	1541 4X4	US15	HAG
1	EA	PRIVACY SET	ELA01.056.PRIV	056	BWN
1	EA	MORTISE PRVCY	HDF19.056 2.5” BACKSET	056	BWN

2 EA	LEVER	TBD		
056	BWN			
1 EA	DOOR STOP	BR7008 DOOR BUMPER	150	BWN
1 EA	TOWEL/ROBE HOOKS			
3 EA	SILENCER	SR64		
GRY	IVE			

HW9: RESIDENTIAL PRIVATE STAIR ENTRANCE (201, 213)

1 EA	MORTISE	ENTR/APT HDF20.056 2.5” BACKSET	056	BWN
1 EA	ENTRY SET	MODEL #: ELA01.150.ENTR	056	BWN
2 EA	LEVER	TBD		
056	BWN			
3 EA	HINGE		BB2098 4.5 X 4.5	
US15		HAG		
1 EA	DOOR STOP	BR7008 DOOR BUMPER	150	BWN
1 EA	SURFACE CLSR	4040XP		
689	LCN			
1 SET	SEALS		9850C OR 2525C (AS	
REQD BY MFG)		NGP		
1 EA	DOOR SWEEP	200NSS-LENGTH AS REQD		NGP
3 EA	SILENCER	SR64		
GRY	IVE			

PEEPHOLE?

HW10 DOUBLE DOOR, CLOSET (215)

1 EA	BALL CATCH	MODEL #: 0425.150		150
BWN				
6 EA	HINGE		1541 4X4	
US15		HAG		
1 EA	DUMMY SET	6974.150.FD		150
BWN				
1 EA	PASSAGE SET	MDL #: ELA01.150.PASS 2.5” BACKSET	150	BWN
1 EA	MORTISE	PASSAGE HDF01.056		056
BWN				
4 EA	LEVER	TBD		
056	BWN			
6 EA	SILENCER	SR64		
GRY	IVE			

HW11 DOUBLE DOOR, OWNER’S CLOSET (216)

1 EA	DUMMY SET	6974.150.FD		150
BWN				
1 EA	ENTRY SET	MODEL #: ELA01.150.ENTR	150	BWN
2 EA	LEVER	TBD		
056	BWN			

1 EA 056	FLUSH BOLT BWN	0600.150		
6 EA GRY	SILENCER IVE	SR64		
6 EA US15	HINGE	HAG	1541 4X4	

HW12 INTERIOR PANIC (102 B, 104)

1 EQ 17LCN	SURFACE CLOSER	4040XP		
1 EA 630	PANIC HARDWARE FAL		F-XX-M	
1 EA 630	TRIM FAL		VANGUARD 820 NL	
EXIT SIGN				
3 EA US15	HINGE	HAG	BB2098 4.5 X 4.5	
1 EA IVE	KICKPLATE	8400 10” X 34” LDW		630
1 SET REQD BY MFG)	SEALS	NGP	9850C OR 2525C (AS	
1 EA	THRESHOLD	AS REQUIRED		
3 EA GRY	SILENCER IVE	SR64		
1 EA BLK	SECURITY FLOOR STOP IVE		FS18S/FS18L (AS REQD)	

HW 13 RES STAIR DOOR PASSAGE 001, 107, 103, 200, 212

1 EA BWN	PASSAGE SET	ELA01.056.PASS		056
1 EA BWN	MORTISE	PASSAGE HDF01.056		056
3 EA US15	HINGE	HAG	BB2098 4.5 X 4.5	
1 EQ 17LCN	SURFACE CLSR	4040XP		
2 EA 056	LEVER BWN		TBD	
1 SET REQD BY MFG)	SEALS	NGP	9850C OR 2525C (AS	
1 EA	DOOR SWEEP	200NSS-LENGTH AS REQD		NGP
1 EA IVE	KICKPLATE	8400 10” X 34” LDW		630
1 EA	DOOR STOP	BR7008 DOOR BUMPER	150	BWN
3 EA GRY	SILENCER IVE	SR64		

HW14 UTILITY DOORS (005, 108, 109)

1 EQ	SURFACE CLOSER	4040XP	17	
1 SET	SEALS		9850C OR 2525C (AS REQD BY MFG)	NGP
1 EA	DOOR SWEEP	200NSS-LENGTH AS REQD		NGP
1 EA	ENTRANE SET	ELA01.056.PRIV		056 BWN
1 EA	MORTISE	STR RM HDF21.056 2.5” BACKSET	056	BWN
3 EA	HINGE		BB2098 4.5 X 4.5 US15	HAG
1 EA	FLOOR STOP	FS18S/FS18L (AS REQUIRED)	BLK	IVE
1 EA	KICKPLATE	8400 10” X 34” LDW		630 IVE
3 EA	SILENCER	SR64		GRY IVE
1 EA	SECURITY FLOOR STOP		FS18S/FS18L (AS REQ)	BLK IVE
1 EA	THRESHOLDS	AS REQUIRED		

HW15 RAYDOOR SLIDING WALL

2 EA	FLOOR STRIKE LOCK	RAY
2 EA	RECTANGULAR PULL	RAY
1 EA	GIRO DOOR CONNECTOR	RAY
1 SET	SLIDING LOW PROFILE MOUNT	RAY
2 EA	SOFT CLOSE	

HW16 RAYDOOR SLIDING POCKET WALL

1 EA	PRIVACY LOCK THUMB/KEY	RAY
1 EA	SOFT CLOSE	RAY
1 EA	RECTANGULAR PULL	
1 SET	SLIDING LOW PROFILE MOUNT	RAY

PROVIDE THE FOLLOWING:

(12) CONSTR MYKYS	BY HARDWARE SUPPLIER
(3) CONSTR CONTROL	BY HARDWARE SUPPLIER
(1) XTRA KY PER CORE	KEY

(6) GMKYS KEY

(6) MKYS (PER SET) KEY

KEY STAMPING STAMPING (AS DIRECTED BY THE OWNER)

EA INSTALLATION REVIEW BY DISTRIBUTER AHC, AFTER INSTALLATION

EA HARDWARE SCHEDULE BY HARDWARE SUPPLIER

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Sound-rated hollow metal doors and frames.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers.

B. Section 08 7100 - Door Hardware.

C. Section 09 9113 - Exterior Painting: Field painting.

D. Section 09 9010 - Interior Paints and Coatings: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

C. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

E. ITS (DIR) - Directory of Listed Products; current edition.

F. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

G. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

I. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

J. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

K. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

L. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.05 QUALITY ASSURANCE

A. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 PERFORMANCE REQUIREMENTS

A. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Type , Interior Doors, Non-Fire Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch (0.8 mm), minimum.

B. Type , Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch (0.8 mm), minimum.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      b. Attach fire rating label to each fire rated unit.
   3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.

C. Door Frames, Fire-Rated: Knock-down type.
   1. Fire Rating: Same as door, labeled.

2.05 ACCESSORIES

A. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

B. Astragals for Double Doors: Specified in Section 08 7100.

C. Grout for Frames: Portland cement grout with maximum 4 inch (102 mm) slump for hand troweling; thinner pumpable grout is prohibited.

D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

F. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick, electrolytic zinc-coated or metallic-coated steel sheet.
   1. Wall Anchors in Masonry Construction: 0.177-inch- (4.5-mm-) diameter, steel wire complying with ASTM A 510 (ASTM A 510M) may be used in place of steel sheet.

G. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.06 FABRICATION

A. Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and fra mes from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- (1.3-mm-) thick, metallic-coated, inverted steel channels with channel webs placed even with top and bottom edges.

C. Interior Door Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:
   1. Cold-rolled steel sheet.

D. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.

E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

F. Clearances for Fire-Rated Doors: As required by NFPA 80.

G. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

H. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

I. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

J. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier.
   1. In addition to typical door and frame hardware, coordinate and factory prepare doors and frames as required for security devices and all other building systems devices.
   2. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
   3. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.

K. Frame Construction: Fabricate frames to shape shown.
   1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints, unless otherwise indicated.
   2. Provide welded frames with temporary spreader bars.

L. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

M. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
   1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
   2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
   3. In existing concrete or masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
   4. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
   5. Install fire-rated frames according to NFPA 80.
   6. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.

E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

F. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
   1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
   2. Smoke-Control Doors: Install to comply with NFPA 105.

G. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
   1. Use machine tools and jigs to precisely cut metal doors.
   2. After cutting, deburr edges and prime metal surfaces with specified primer before hanging.
   3. Site finishing is specified in section 09 9000.

H. Install door hardware as specified in Section 08 7100.

I. Coordinate installation of electrical connections to electrical hardware items.

J. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1416
WOOD DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior wood doors; flush configuration; fire-rated, non-rated, and acoustical.

B. Glazed, flush wood doors.

C. Jambs and frames to receive finish in field.

D. Metal Clad Exterior Doors and frames

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames:

B. Section 08 3250 - Sliding Room Divider Wall.

C. Section 08 7100 - Door Hardware.

D. Section 08 8000 - Glazing.

E. Section 09 9123 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

E. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate requirements for veneer matching.

D. Specimen warranty.
   1. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not comply with tolerances in referenced quality standard.
   2. Warranty agreement shall also provide installation and finishing required due to repair or replacement of defective doors.

E. Manufacturer's Installation Instructions: Indicate special installation instructions.

F. Quality Control Submittals: Certificates: Submit performance test results reported by independent laboratory or manufacturer’s Statement of Qualification indicating compliance with specified performance and design requirements.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Section 1300 Custom Grade.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

D. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 PROJECT CONDITIONS

A. Protect Work from moisture damage. Do not deliver material until all wet work is complete and allowed to dry not less than 72 hours.
   1. Do not deliver wood doors to the site until exterior doors and windows are installed, HVAC system is operating and temperature and humidity control can be assured. Maintain minimum temperature of 60 degrees F and relative humidity between 25 and 55 percent for not less than 2 days prior to delivery of millwork and for the remainder of the construction period.

B. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings, prepared by the manufacturer before proceeding with factory machining.

1.09 COORDINATION

A. Construction Manager shall be responsible for coordinating and obtaining necessary information from Hardware and Frame manufacturers to provide door supplier with approved hardware and frame schedules with templates 60 days prior to desired delivery date of doors.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

D. Submit written warranty agreement signed by Manufacturer, Installer, and Contractor agreeing to pay a reasonable charge to repair or replace defective doors and rehang with new doors provided the defect was not apart prior to installation. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Painted Solid Wood Doors:
   1. Basis of Design: Jeld Wen
      a. Product line: Custom Wood All Panel Interior Door
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Translucent Glass Panel Doors
   1. Basis of Design: Jeld Wen

a. Product line: MODA™ Glass Panel Interior Door
2. Substitutions: See Section 01 6000 - Product Requirements.

C. Metal Clad Wood Doors
1. Basis of Design: Kolbe
a. Product line: Ultra Series
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

A. Doors: Refer to drawings for locations and additional requirements.
1. Quality Level: Custom Grade, in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.

B. Exterior Metal Clad Doors
1. Water repellent treated.
2. Thickness: 1-3/4 inches (44 mm), unless otherwise indicated.
3. Exterior Door Cladding: Aluminum sheet as indicated.
4. Exterior Frame Cladding: Extruded aluminum as indicated.

C. Interior Glass Panel Door: 1-3/8 inches (44mm) thick unless otherwise indicated

D. Interior Solid Wood Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; All panel construction.

2.03 DOOR AND PANEL CORES

A. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 ACCESSORIES

A. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions. Comply with final hardware schedules, door grade Shop Drawings, DHI A115-W series standards, and hardware templates.
1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Opening: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

D. Provide solid blocks at lock edge and top of door from closer for hardware reinforcement.
1. Provide solid blocking for other throughbolted hardware.

E. Bond edge banding to cores.

F. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

G. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

H. Provide edge clearances in accordance with the quality standard specified.

I. Factory or field glaze doors.

2.06 FINISH

A. Finish materials and acceptable products are specified in Section 09903

B. Factory prime doors and individually polybag.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Opaque:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Color: As selected by Architect.
      c. Sheen: Flat.

2.08 ACCESSORIES

A. Kolbe Glazed Openings:

B. Jeld Wen Glazed Openings:
   1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
   2. Tint: Clear.

C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

2.09 DOOR TYPES

A. Door Type A
   1. Fire Rating: 60 Minute
   2. Jeld-Wen: E1730

B. Door Type B1, Swinging
   1. Jeld-Wen: E0128

C. Door Type B2, Pocket
   1. Jeld-Wen: E0128

D. Door Type B3
   1. Jeld-Wen: PMT1024

E. Door Type C
   1. Jeld-Wen: PMP1024

F. Door Type D
   1. Fire Rating: 90 Minute
   2. Jeld-Wen: Steel 1Panel

G. Door Type E
   1. Kolbe: Ultra Series, Metal Clad, Commercial Entrance Doors
   2. Wood Species: oak

H. Door Type F
   1. Kolbe: Ultra Series, Metal Clad, Commercial Entrance Doors
   2. Wood species oak

I. Door Type G
   1. Kolbe: Ultra Series, Metal Clad, Commercial Entrance Doors
   2. Wood Species: oak

J. Door Type H
   1. Kolbe: Ultra Series, Metal Clad, Commercial Entrance Doors
   2. Wood Species: oak

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Examine installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

D. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
1. Install fire-rated doors in accordance with NFPA 80 requirements.
2. Hardware: For installation, see Division 8 Section "Door Hardware."
3. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

B. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
1. Adjust width of non-rated doors by cutting equally on both jamb edges.

C. Field-Finished Doors: Trimming to fit is acceptable.
1. Adjust width of non-rated doors by cutting equally on both jamb edges.
2. Trim maximum of 3/4 inch (19 mm) off bottom edges.
3. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

G. Install accessory items as required

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

C. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 by 84 inches surface area.

D. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 by 84 inches surface area.

E. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inches surface area.

3.04 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.
1. Finished Doors: Refinish or replace doors damaged during installation.
2. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

B. Adjust doors for smooth and balanced door movement.

C. Adjust closers for full closure.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule appended to this section.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall access door and frame units.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units in Wet Areas:
   1. Size: 12 inch by 12 inch (305 mm by 305 mm).

2.02 WALL-MOUNTED UNITS

A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com/#sle.
   2. Babcock-Davis; : www.babcockdavis.com/#sle.
   3. Cendrex, Inc: www.cendrex.com/#sle.
   4. Nystrom, Inc; : www.nystrom.com/#sle.

B. Wall-Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
   4. Hardware:
      a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 3223
SLIDING ROOM DIVIDER WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory fabricated sliding door/wall with tracks and operating hardware.
   1. Wood panel frame system.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Rough opening framing.

B. Section 08 7100 - Door Hardware: Cylinder locks.

1.03 REFERENCE STANDARDS

A. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide information on dimensions, frame and sill construction, tracks, and hardware.

C. Shop Drawings: Indicate wall dimensions, elevations of different types, and framed opening tolerances.

D. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in, and with not fewer than three years of experience, manufacturing products of the type specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site and store in manufacturer's protective cartons until openings are ready for installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - ALUMINUM PANEL FRAME

A. Floor Mounted
   1. Basis of design:
      a. Raydoor

2.02 SLIDING/FOLDING GLAZED DOORS/WALLS

A. Wood Sliding Doors/Walls: Solid laminated wood sliding/folding and operable panel frames, factory fabricated; complete with flashings, support and anchorage devices, and glazing.
   1. Configuration: Inward opening, left stacking.
   2. Support System: Floor mounted.
   3. Standard Sill: Flush type, with sealant, shims and fasteners at necessary locations.
   4. Panel Thickness: 2-5/8 inch (66 mm).

2.03 FACTORY ASSEMBLY

A. Factory assemble sliding/folding operable panel frames as single unit, including head, jambs, and bottom sections; provide concealed fasteners.
   1. Sizes: Allow for tolerances of rough framed openings, clearances, and shims at perimeter of assemblies.
   2. Joints and Corners: Flush, hairline and waterproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   3. Glazing: Factory installed.

2.04 ACCESSORIES

A. Wood for Casings and Trim: Clear southern yellow pine, clear preservative-treated, of type suitable for required finish.

B. Sliding/Folding Hardware: Provide manufacturer's standard hardware including carriages with sealed ball bearing rollers, and top or bottom tracks.

C. Exposed Hardware Finish: submit finish options for selection by architect.

D. Hinges: Manufacturer's standard type.

E. Locking Mechanisms: Minimum two-point deadbolt locking of each panel; manufacturer's standard type.

F. Swing Door Locking: Lever handle lockset with deadbolt into jamb strike; manufacturer's standard type.

G. Anchors: Hot-dipped galvanized or stainless steel in accordance with project and manufacturer's installation requirements.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on approved shop drawings.

B. Verify that overhead structural supports are adequate and deflection is in compliance with manufacturer's installation requirements.

3.02 INSTALLATION

A. Install door/wall unit assembly in accordance with manufacturer's instructions.

B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Use anchorage devices to securely fasten assembly to adjacent construction without distortion or imposed stresses.

3.03 CLEANING

A. Remove protective material from factory finished surfaces.

B. Remove labels and visible markings.

C. Wash surfaces by method recommended and acceptable to sealant; rinse and wipe surfaces clean.

3.04 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5200
WOOD WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory fabricated wood windows.

B. Glazing.

C. Metal clad windows,

D. Operating hardware.

E. Wood trim for interior finishing.

F. Metal trim for exterior windows

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Rough opening framing.

B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 09 9010 - Interior Paints and Coatings: Site finishing wood surfaces.

D. Section 09 9113 - Exterior Painting: Site finishing wood surfaces.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.

B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Amendments and Errata.

D. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2010).

E. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.

C. Submit two samples of each type of operating hardware.

D. Manufacturer's Certificate: Certify that products furnished meet or exceed specified requirements.

E. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 10 year period after Date of Substantial Completion.

C. Provide 20 year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Clad Wood Windows:
   1. Basis of Design: Kolbe, Ultra Series.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WOOD WINDOWS

A. Wood Windows: Wood frame and sash, factory fabricated and assembled.
   1. Configuration: As indicated on drawings.
   2. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.

2.03 COMPONENTS

A. Glazing: Double glazed, clear, Low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.

B. Frame: Constructed of kiln-dried pine, with pine interior stops and mull casings on mulled units, water repellent, preservative treated in accordance with WDMA I.S. 4-07'A. Ultra assembled frames have factory installed heavy vinyl nailing fins at head, side jambs, and sill. Nailing fin at head has integral drip cap. Transom head drip cap to be field applied to frame. Units with brickmould or casing do not have a vinyl nailing fin factory applied as standard.
   1. Jamb Thickness: 3/4 inch (19mm) at the side jambs and head.
   2. Standard overall jamb with extensions applied: 4-9/16 inch (116mm).
   3. Sill thickness: 1-3/16 inch (30mm) with 14° slope.
   4. Exterior: All frame parts are .050 inch (1.3mm) thick 6063 extruded aluminum alloy with accessory grooves, press fit onto the wood frame.
   5. Corner Construction: Head and side jambs have mitered corners and use internal corner keys with sealer. Sill end has a profile cut and utilizes an end key with sealer.
   6. FSC Certified wood requiring Chain of Custody (COC) label.

C. Sash: Constructed of kiln dried pine, water repellent, preservative treated in
   1. accordance with WDMA I.S. 4-07'A.
      a. Thickness: 1-3/8 inch (35mm) [1-23/32 inch (44mm) Transom].
      b. Exterior: Sash parts are completely covered by a .019 inch (0.5mm) thick 5052 roll formed aluminum alloy with all corners lap jointed and sealed.
      c. Corner Construction: Mortise-and-tenon.
      d. FSC Certified wood requiring Chain of Custody (COC) label.
      e. Interior glazed.
      f. Sash Lift Plough: Machined on top rail of the upper sash and bottom rail of the lower sash. [plough in lower sash only] [plough in upper sash only] [no ploughs]. Ploughs are not available on bottom sash of High Performance units due to enhanced interior sill stop and waterseal.

D. Surface Finish:
   1. Exterior Finish - Aluminum
   2. Standard Paint Colors: Exterior aluminum frame and sash components, and PDL bars are to have a 70% fluoropolymer based coating in compliance with AAMA 2605-13 specifications. Color is to be selected by architect.
   3. Interior Finish - Wood:
   4. Interior wood is to have acrylic type paint applied. The interior paint color is to be selected by architect.

E. Weatherstripping:
   1. Frame Head Parting Stop: Rigid weatherable PVC parting stop with flexible fins\
   2. Top Rail, Check Rail, and Bottom Rail: Black TPE compression bulb.
   3. Sill: Rigid weatherable, UV resistant PVC water seal/weatherstrip. Passes drop dart test
   4. Head Pad: Polyurethane and polyethylene foam pad.
   5. Jambliners: Made of weatherable, UV resistant PVC. Passes drop dart test.
   6. Transom Frame Nosing: Full perimeter 7/8 inch (22mm) closed cell foam backer rod.

F. Jamb Extensions: Provide factory installed jamb extensions up to 12 inches for wall thickness as needed.
   1. Finish: Match interior frame finish.

G. Sills: Extruded aluminum, sloped for positive drainage; fits under sash and projects at least 1/2 inch (12 mm) beyond exterior face of wall; single piece full width of opening.

H. Performance Divided Lites (PDL): PDL system utilizes a permanently adhered wood grille bar to the interior and a permanently adhered aluminum grille bar to the exterior glass.
   1. Material: Muntin is constructed of .050 inch (1mm) thick 6063 extruded aluminum alloy on exterior, pine on interior

I. Accessories & Trim
   1. Casings
   2. Nosings
   3. Frame Expanders
   4. Mull Covers

J. Fasteners: Stainless steel.

K. Sealant and Backing Materials: As specified in Section 07 9200 of types as indicated.

L. Flashing: Provide related flashings, with necessary anchors and attachment devices.

M. Sealant for Setting Sills, Stools, Aprons, and Sill Flashing: Non-curing butyl type.

2.04 PERFORMANCE REQUIREMENTS

A. Comply with AAMA/WDMA/CSA 101/I.S.2/A440 requirements for the specific window type in accordance with the following:
   1. Performance Class (PC): R.

B. Design Pressure (DP): In accordance with applicable codes.

C. Fenestration Assembly Thermal transmittance (U-value): Comply with ASHRAE Std 90.1 I-P for building envelope requirements for applicable climate zone.

2.05 HARDWARE

A. Double Hung Sash: Metal and nylon spiral friction slide cylinder, each sash, each jamb.

B. Pulls: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

B. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inch per 3 ft (1.6 mm per m) non-cumulative or 1/8 inch per 10 ft (3.2 mm per 3 m), whichever is less.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed wood windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.

1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf (91 Pa).
2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf (300 Pa).

C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Refer to Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove protective material from factory finished surfaces.

C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for doors.

B. Hardware for fire-rated doors.

C. Hardware for fire-rated doors.

D. Thresholds.

E. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 1416 - Wood Doors and Frames.

1.03 REFERENCE STANDARDS

A. BHMA A156.1 - American National Standard for Butts and Hinges; 2016.

B. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2017.

C. BHMA A156.3 - American National Standard for Exit Devices; 2014.

D. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

E. BHMA A156.6 - American National Standard for Architectural Door Trim; 2015.

F. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2017.

G. BHMA A156.16 - American National Standard for Auxiliary Hardware; 2013.

H. BHMA A156.21 - American National Standard for Thresholds; 2014.

I. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2017.

J. BHMA A156.25 - American National Standard for Electrified Locking Devices; 2013.

K. BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators; 2013.

L. ITS (DIR) - Directory of Listed Products; current edition.

M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

N. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

O. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

C. Keying Requirements Meeting:
   1. Attendance Required:
      a. Owner.
   2. Agenda:
   3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:

4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
5. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Provide complete description for each door listed.

D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.

E. Samples for Verification:
1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
2. Submit one (1) sample of hinge, latchset, lockset, and closer illustrating style, color, and finish.
3. Return full-size samples to Contractor.
4. Submit product description with samples.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

H. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

I. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

J. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Lock Cylinders: Ten for each master keyed group.
3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
   1. Locksets and Cylinders: Three years, minimum.
   2. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   3. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or _____ as suitable for application indicated.

2.02 HINGES

A. Manufacturers:
   1. Basis of Design: Baldwin.
   2. Hager Companies; : www.hagerco.com/#sle.

B. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Provide hinges on every swinging door.
   2. Provide non-removable pins on exterior outswinging doors.
   3. Provide electrified hinges as required.
   4. Provide non-removable pins on interior outswinging doors at locations as indicated in Door Hardware Schedule.
   5. Provide following quantity of butt hinges for each door:
      a. Doors up to 60 inches (1.5 m) High: Two hinges.
      b. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.

2.03 TRACK AND HANGERS

A. Pocket Doors: Provide pocket door kit, including header assembly, split studs, hangers, door hanger plates, bumper, guides, floor plate, and end bracket.
   1. Provide flush cup pull on both sides.
   2. Provide edge pull in leading edge.

B. Sliding walls: See section 08 3250 for Sliding Room Divider Walls.

2.04 FLUSH BOLTS

A. Flush Bolts: Comply with BHMA A156.16, Grade 1.
   1. Flush Bolt Throw: 3/4 inch (19 mm), minimum.

2.05 EXIT DEVICES

A. Exit Devices: Comply with BHMA A156.3, Grade 1.
   1. Lever design to match lockset trim.
   2. Provide cylinder with cylinder dogging or locking trim.
   3. Provide exit devices properly sized for door width and height.
   4. Provide strike as recommended by manufacturer for application indicated.
   5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

2.06 ELECTRIC STRIKES

A. Electric Strikes: Comply with BHMA A156.31, Grade 1.
   1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
   2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.

2.07 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
   1. Provide cylinders from same manufacturer as locking device.
   2. Provide cams and/or tailpieces as required for locking devices.

2.08 CYLINDRICAL LOCKS

A. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
   1. Bored Hole: 2-1/8 inch (54 mm) diameter.
   2. Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
   3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
   4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
      a. Finish: To match lock or latch.

2.09 MORTISE LOCKS

A. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
   1. Latchbolt Throw: 3/4 inch (19 mm), minimum.
   2. Deadbolt Throw: 1 inch (25.4 mm), minimum.
   3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
   4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
      a. Finish: To match lock or latch.

2.10 ELECTROMECHANICAL LOCKS

A. Electromechanical Locks: Comply with BHMA A156.25, Grade 1.
   1. Provide motor-driven or solenoid-driven locks, with strike that is applicable to frame.
   2. Type: Mortise deadbolt.

2.11 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
   1. Basis of Design: Baldwin.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
   1. Pull Type: Straight, unless otherwise indicated.
   2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
      a. Edges: Beveled, unless otherwise indicated.
   3. Material: Aluminum, unless otherwise indicated.

2.12 CLOSERS

A. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.

2. Provide door closer on each exterior door.

2.13 KICK PLATES

A. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 8 inch (203 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.14 DOOR HOLDERS

A. Door Holders: Comply with BHMA A156.16, Grade 1.
   1. Type: Lever, or kick down stop, with rubber bumper at bottom end.
   2. Material: Aluminum.

2.15 FLOOR STOPS

A. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Type: Manual hold-open, with pencil floor stop.
   2. Material: Aluminum housing with rubber insert.

2.16 THRESHOLDS

A. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at each exterior door, unless otherwise indicated.
   2. Type: Flat surface.
   3. Material: Aluminum.
   4. Threshold Surface: Fluted horizontal grooves across full width.
   5. Field cut threshold to profile of frame and width of door sill for tight fit.
   6. Provide non-corroding fasteners at exterior locations.

2.17 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. National Guard Products, Inc; : www.ngpinc.com.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Adjustable.
   2. Door Sweep Type: Encased in retainer.
   3. Material: Aluminum, with brush weatherstripping.

2.18 COAT HOOKS

A. Coat Hooks: Provide on room side of swinging bathroom door, screw fastened.
   1. Material: satin nickle.

2.19 SIGNAGE

A. Signage (Room Name Plates and Numbers): Provide at exterior doors and apartment entrance doors for individuals to easily identify room names and/or numbers.

2.20 SILENCERS

A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   1. Single Door: Provide three on strike jamb of frame.
   2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   3. Material: Rubber, gray color.

2.21 VIEWER

A. Viewer: Provide a fire rated viewer at inside of door at eye level to see who is on outside of door, with integral door knocker.
   1. Material: Stainless steel.

2.22 WIRELESS ACCESS MANAGEMENT SYSTEMS

A. Wireless Access Management Systems: Comply with guidelines of BHMA A156.25, and including necessary hardware for fully functional system.
   1. Reader Formats: Provide magnetic stripe, proximity, dual validation, or key Fob to activate access system functionality.
   2. Door Locking Hardware: Provide applicable cylindrical locksets, panic hardware, or mortise locksets in compliance with project access control requirements.

2.23 FIRE DEPARTMENT LOCK BOX

A. Manufacturers:
   1. Basis of Design: Knox Box - 3200 Series.
   2. Knox Company; Knox-Box Rapid Entry System, : www.knoxbox.com.

B. Fire Department Lock Box:
   1. Capacity: Holds 2 keys.
   2. Finish: Manufacturer's standard dark bronze.

2.24 EXIT MOTION SENSOR

A. Exit Motion Sensor: Interior passive infrared detection device to initiate door release of exit door magnetic lock.
   1. Power: 12 VDC.
   2. Provide adjustable detector face to allow for precise pattern configurations, and easy pattern adjustment.
   3. Provide relay that operates before transistor to prevent false alarms.
   4. Operating Temperature: 32 to 110 degrees F (0 to 43 degrees C).

2.25 FINISHES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

E. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.07 SEE SECTION 08 0671 FOR HARDWARE SCHEDULE.

END OF SECTION

SECTION 09 2100
INTERIOR PLASTER PRESERVATION

PART 1 GENERAL

1.01 SUMMARY

A. Repair, patching/restoration of interior plaster surfaces.

B. Restore plaster surfaces:
   1. Where removal is indicated or required to complete renovation.
   2. Where original plaster is missing, damaged, or loose, and restoration is indicated.

1.02 RELATED SECTIONS

A. Section 01 7800 - Closeout Submittals: Record documentation.

B. Section 02 4100 - Selective Demolition: Preparation and protection.

C. Section 09 9010 - Interior Paints and Coating.

1.03 PERFORMANCE

A. Where patching is required, match finish plaster mix composition of adjacent existing plaster, as closely as possible.

B. Survey existing plaster and review with Architect before starting removal. Plaster removal is required where indicated and for the following reasons:
   1. Unbonded, broken, loose, and otherwise damaged existing plaster in the area of the Work as identified by the plasterer and confirmed by the Architect.
   2. Plaster shown to be removed.
   3. Plaster which must be removed to carry out the Work under this Contract.
   4. Sufficient plaster, at damaged substrates, to permit repair of substrate.
   5. Plaster Accessories and Lath: Remove where damaged and, in addition, where necessary to carry out the Work.
   6. Coordinate removal of plaster back to masonry and to solid adjacent plaster. Make edges straight, clean, sharp, and beveled inward.

C. Plaster finish textures: Repairs, restorations, and stabilization's shall match the smooth existing finishes and be blended so that modifications are indiscernible from original work. Report uncertainties to Architect for direction.

D. Where replacement/restoration of existing plaster surfaces and moldings is indicated, material content of restoration finish plaster mixes shall be limited in composition to materials present in the original plaster.

1.04 REFERENCES

A. ASTM C 28/C 28M - Standard Specification for Gypsum Plasters; 2000 (Reapproved 2005).

B. ASTM C 35 - Standard Specification for Inorganic Aggregates for Use in Gypsum Plaster; 2001 (Reapproved 2009).

C. ASTM C 206 - Standard Specification for Finishing Hydrated Lime; 2003.

D. ASTM C 631 - Standard Specification for Bonding Compounds for Interior Gypsum Plastering; 2009.

E. ASTM C 842 - Standard Specification for Application of Interior Gypsum Plaster; 2005.

F. ASTM C 926 - Standard Specification for Application of Portland Cement-Based Plaster; 2006.

G. ICC (IBC) - International Building Code; 2009.

H. NPS Technical Preservation Services Preservation Brief 21: Repairing Historic Flat Plaster Walls and Ceilings; 1989.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide product data on proprietary materials, identifying characteristics and
   1. limitations of products specified. For hydrated limes, provide manufacturer's label data showing elemental chemical composition; for aggregate, provide sieve analysis.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C 842.
   1. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum ten years of documented experience.

1.07 MOCK-UPS

A. Build mockups to comply with the following requirements, using materials indicated for final unit of Work. Unless otherwise directed by the Architect, prepare mockups at the same general location as required for subsequent application of paint coating system mockups.
   1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect one week in advance of the dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects, repair and stabilization procedures, and workmanship.
      a. Incorporate representative samples of each type of repair to the extent feasible:
         1) Simple patch on existing substrate.
   4. Obtain Architect's approval of mockups before start of final unit of Work.
   5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.08 FIELD CONDITIONS

A. Maintain minimum ambient temperature of 50 degrees F during installation of plaster and until cured.

B. Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

C. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 PRODUCTS

2.01 MANUFACTURERS OF PROPRIETARY MATERIALS

A. Gypsum Plaster:
   1. USG. www.usg.com. Or approved equal.
   2. Substitutions: See Section 01600 - Product requirements.

2.02 PLASTER MATERIALS

A. High-strength Gypsum Neat Plaster: with a minimum, average, dry compressive strength of 2800 psi per ASTM 472 for a mix of 100 lb of plaster and 2 cu. ft. of sand.
   1. Product: Subject to compliance with requirements, provide STRUCTO-Base Brand Gypsum Plaster by United States Gypsum company, or approved equal.

B. Gauging Plaster: with minimum, average, dry compressive strength of 1200 psi per ASTM C28.
   1. Product: subject to compliance with requirements, provide RED TOP Brand Gauging Plaster and Lime Finish manufactured by United States Gypsum Company, or approved equal.

C. Aggregate: Match size, texture, and gradation of existing aggregate as closely as possible. Existing plaster has not been sampled.

D. Water: Clean and Potable, free of mineral or organic matter that could adversely affect plaster.

2.03 LATH

A. Lath and Accessories: Salvage in place, reuse, and match existing to the extent feasible and as required to preserve and repair the existing plaster.

2.04 PLASTER MIXES

A. Over Metal Lath: Three-coat application, gypsum neat plaster and sand mixed and proportioned in accordance with ASTM C 842.

B. Over Other Solid Bases: Two-coat application, gypsum neat plaster and sand mixed and proportioned in accordance with ASTM C 842.

C. Finish Coat for Floated Finish: Lime putty with gypsum gauging plaster, mixed and proportioned in accordance with ASTM C 842.

D. Mix only as much plaster as can be used prior to initial set.

E. Mix materials dry, to uniform color and consistency, before adding water.

F. Protect mixtures from freezing, frost, contamination, and excessive evaporation.

G. Do not retemper mixes after initial set has occurred.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify and layout the extent of plaster removal required before starting removal.
   1. "Sound" existing plaster by tapping surface and mark periphery of areas to be removed.
   2. In areas where plaster sounding indicates selective removal and replacement:
      a. Verify existence of sound lath/masonry substrate beneath. Refer uncertainties to Architect before commencing selective removal operations.
   3. Chisel 1" outside of line of unsound plaster or plaster indicated to be removed
   4. Angle chisel to provide slight undercut to tooth into new plaster.

B. Verify that existing conditions are satisfactory before starting work.

C. Masonry: Verify joints are cut flush and surface is ready to receive work of this section.

D. Grounds and Blocking: Verify items within walls for other sections of work have been installed.

E. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.

F. Mechanical and Electrical: Verify services within walls have been tested and approved.

3.02 PREPARATION OF SOLID SURFACES

A. Paint, Dirt, Oil, Grease, and Other Foreign Matter: Remove every trace from surfaces to receive new plaster. Remove surface salt deposits as indicated.

B. Cracks: Enlarge cracks, except to remove soft, broken, or loose materials, or to repair backup materials. Widen cracks to at least 1/8" and install patching material.

C. Dampen masonry surfaces to reduce excessive suction.

3.03 PLASTERING

A. Apply gypsum plaster in accordance with ASTM C842 and manufacturer's instructions.

B. Three-coat Application, finish thickness to match existing:
   1. Apply first coat to nominal thickness of 3/8 inch.
   2. Apply second coat to nominal thickness of 3/8 to 3/4 inch, depending on the shape of the stone.

3. Apply finish coat to nominal thickness of 1/8 to 1/4 inch.

C. Moist cure base coats.

D. After curing, dampen previous coat prior to applying finish coat.

E. Finish Texture: Provide a consistent appearance; match appearance of existing texture at location designated by Architect.

F. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.

G. Perform work in panels to nearest natural break or between accessories.

H. Moisture cure finish coat for minimum period of 48 hours.

3.04 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.
B. Metal stud wall framing.
C. Metal channel ceiling framing.
D. Gypsum sheathing.
E. Cementitious backing board.
F. Gypsum wallboard.
G. Joint treatment and accessories.
H. Acoustic (sound-dampening) wall and ceiling board.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
C. Section 07 2100 - Thermal Insulation: Acoustic insulation.
D. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
E. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
E. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).
F. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.
H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2017a.
I. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
J. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.
K. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
L. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2013.

M. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2013a.

N. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.

O. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.

P. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.

Q. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

R. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

S. ASTM E413 - Classification for Rating Sound Insulation; 2010.

T. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

U. GA-600 - Fire Resistance Design Manual; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches (300 by 300 mm) in size, illustrating finish color and texture.

1.05 MOCK-UP

A. As soon as sample approvals are obtained, erect and finish a room mock-up. Unless otherwise directed by the Architect, Finish the interior walls and ceiling of designated area of room duplicating the texture and finish approved on sample submittal. Mock-up will be used to evaluated paint finish quality and sheen ans shall remain partially painted as a reference standard until directed by the Architect to be completed. At this time the whole mock-up shall be re-painted with the entire approved paint finish system to achieve visual uniformity.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 10 years of experience.

B. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold resistant board is required at basement locations, as indicated on Drawings..
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
      b. Ceilings: 5/8 inch (16 mm).
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

4. Paper-Faced Products:
    a. American Gypsum Company; FireBloc Type X Gypsum Wallboard.
    b. CertainTeed Corporation; Type X Drywall.
    c. Georgia-Pacific Gypsum; ToughRock.
    d. Georgia-Pacific Gypsum; ToughRock Fireguard X.
    e. Georgia-Pacific Gypsum; ToughRock Fireguard C.
    f. National Gypsum Company; Gold Bond BRAND Fire-Shield Gypsum Board.
    g. USG Corporation; Sheetrock Brand Gypsum Panels..
    h. Substitutions: See Section 01 6000 - Product Requirements.
5. Mold Resistant Paper Faced Products:
    a. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall.
    b. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
    c. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
    d. National Gypsum Company; Gold Bond 3/4" Ultra-Shield FS XP Gypsum Board.
    e. Substitutions: See Section 01 6000 - Product Requirements.
6. Glass Mat Faced Products:
    a. Continental Building Products; Weather Defense Platinum Interior Type X.
    b. Georgia-Pacific Gypsum; DensArmor Plus Fireguard C.
    c. National Gypsum Company; Gold Bond eXP Fire-Shield Interior Extreme Gypsum Panel.

B. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds, shower ceilings, and Kitchens.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
    a. Fire Resistant Type: Type X core, thickness 5/8 inch (16 mm).
    b. Products:
        1) Georgia-Pacific Gypsum; DensShield Tile Backer.
        2) Substitutions: See Section 01 6000 - Product Requirements.

C. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
2. Edges: Square.

D. Shaftwall and Coreboard: Type X; 1 inch (25 mm) thick by 24 inches (610 mm) wide, beveled long edges, ends square cut.
1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
2. Glass Mat Faced Products:
    a. CertainTeed Corporation; GlasRoc Shaftliner Type X.
    b. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant).
    c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 GYPSUM WALLBOARD ACCESSORIES

A. Water-Resistive Barrier: As specified in Section 07 2500.

B. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
2. Corner Beads: Low profile, for archways.
3. Architectural Reveal Beads:
    a. Reveal Depth: 1/2 inch (12 mm).
    b. Reveal Width: 1/2 inch (12 mm).
    c. Shapes: As indicated on drawings.

C. Decorative Metal Trim:
   1. Material: Extruded aluminum alloy 6063-T5 temper.
   2. Finish: Anodized, clear.
   3. Type: Profile as selected from manufacturer's standard range.
   4. Reveal Trim:
      a. Products:
         1) FryReglet: www.fryreglet.com.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
   2. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
   3. Joint Compound: Setting type, field-mixed.

E. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion resistant.

G. Nails for Attachment to Wood Members: ASTM C514.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.

B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/600.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.

F. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

G. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall mounted cabinets.
   3. Plumbing fixtures.

4. Toilet accessories.
5. Wall mounted door hardware.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For non-rated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.
   2. Double-Layer Application: Install base layer using screws or nails. Install face layer using screws or adhesive.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.06 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 09 2236

LATH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lath for cement plaster.

B. Furring for metal lath.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Sheathing on exterior walls.

B. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior plaster and stucco.

C. Section 09 2200 - Portland Cement Plaster.

1.03 REFERENCE STANDARDS

A. ASTM C847 - Standard Specification for Metal Lath; 2014a.

B. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.

D. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2017a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each installation standard referenced on site throughout the duration of lathing and plastering work.

B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lath and Accessories:
   1. Alabama Metal Industries Corporation; ____: www.amico-lath.com/#sle.
   2. Cemco; ____: www.cemcosteel.com/#sle.
   3. Phillips Manufacturing Co; Paperback Lath: www.phillipsmfg.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING MATERIALS

A. Furring Channels: Formed steel, minimum 0.020 inch (0.5 mm) thick, 3/8 inch (10 mm) deep by 7/8 inch (22 mm) high, splicing permitted; galvanized.

B. Lateral Bracing: Formed steel, minimum 0.060 inch (1.5 mm) thick, size and length as required; galvanized.

2.03 LATH

A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
   1. Weight: To suit application and as specified in ASTM C841 or ASTM C1063 for framing spacing.
   2. Weight: 2.5 lb/sq yd (1.4 kg/sq m).

3. Backed with treated paper.

B. Corner Mesh: Formed sheet steel, minimum 0.018 inch (0.5 mm) thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch (50 mm) size; same finish as lath.

C. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.

2.04 ACCESSORIES

A. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.

B. Fasteners: Self-piercing tapping screws; ASTM C1002 or ASTM C954.

C. Tie Wire: Annealed galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrates are ready to receive work and conditions are suitable for application.

C. For exterior plaster and stucco on stud walls, verify that water-resistive barrier has been installed over sheathing substrate completely and correctly.

D. Do not begin until unacceptable conditions have been corrected.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

A. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

3.03 CONTROL AND EXPANSION JOINT INSTALLATION

A. Locate joints as indicated on drawings and comply with ASTM C1063.

3.04 LATH INSTALLATION

A. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches (75 mm) from corner to form the angle reinforcement; fasten at perimeter edges only.

B. Place corner bead at external wall corners; fasten at outer edges of lath only.

C. Place base screeds at termination of plaster areas; secure rigidly in place.

D. Place lath vertically above each top corner and each side of door frames to 6 inches (150 mm) above ceiling line.

E. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

F. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.05 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 09 2420
PORTLAND CEMENT PLASTER

PART 1 GENERAL

1.01 SUMMARY

A. Removal of existing exterior cementitious field plaster, as indicated.

B. Repair, patching, and restoration of exterior plaster surfaces, including ornamental plaster where missing or lost.

C. New Portland cement exterior plaster “stucco” for installation over metal lath and masonry.

1.02 RELATED SECTIONS

A. Section 01 7800 - Closeout Submittals: Record documentation.

B. Section 02 4100 - Selective Demolition: Preparation and protection.

C. Section 04 0510 - Masonry Restoration.

D. Section 09 2236 - Lath.

E. Section 09 9113 - Exterior Painting.

1.03 PERFORMANCE

A. Where patching is required, match finish plaster mix composition of adjacent existing plaster, as closely as possible.

B. Survey existing plaster and review with Architect before starting removal. Plaster removal is required where indicated and for the following reasons:
   1. Unbonded, broken, loose, and otherwise damaged existing plaster in the area of the Work as identified by the plasterer and confirmed by the Architect.
   2. Plaster shown to be removed.
   3. Plaster which must be removed to carry out the Work under this Contract.
   4. Sufficient plaster, at damaged substrates, to permit repair of substrate.
   5. Plaster Accessories and Lath: Remove where damaged and, in addition, where necessary to carry out the Work.
   6. Coordinate removal of plaster back to masonry and to solid adjacent plaster. Make edges straight, clean, sharp, and beveled inward.

C. Plaster finish textures: Repairs, restorations, and stabilization's shall match the smooth existing finishes and be blended so that modifications are indiscernible from original work. Report uncertainties to Architect for direction.

1.04 REFERENCES

A. ASTM C 150 - Standard Specification for Portland Cement; 2007.

B. ASTM C 206 - Standard Specification for Finishing Hydrated Lime; 2003.

C. ASTM C 926 - Standard Specification for Application of Portland Cement-Based Plaster; 2006.

D. ASTM C 932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 2006.

E. ICC (IBC) - International Building Code; 2009.

F. PCA EB049 - Portland Cement Plaster/Stucco Manual; Portland Cement Association; 2003.

G. NPS Technical Preservation Services Preservation Brief 22: The Preservation and Repair of Historic Stucco; 1990.

H. NPS Technical Preservation Services Preservation Brief 23: Preserving Historic Ornamental Plaster; 1990.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide product data on proprietary materials, identifying characteristics and
   1. limitations of products specified. For hydrated limes, provide manufacturer's label data showing elemental chemical composition; for aggregate, provide sieve analysis.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C 926 and Portland Cement Plaster (Stucco) Manual.
   1. Maintain one copy on site.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum ten years of documented experience.

1.07 MOCK-UPS

A. Build mockups to comply with the following requirements, using materials indicated for final unit of Work. Unless otherwise directed by the Architect, prepare mockups at the same general location as required for subsequent application of paint coating system mockups.
   1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect one week in advance of the dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects, repair and stabilization procedures, and workmanship.
      a. Incorporate representative samples of each type of repair to the extent feasible:
         1) Simple patch on existing substrate.
   4. Obtain Architect's approval of mockups before start of final unit of Work.
   5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.08 FIELD CONDITIONS

A. Maintain minimum ambient temperature of 50 degrees F during installation of plaster and until cured.

B. Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

C. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 PRODUCTS

2.01 PLASTER MATERIALS

A. Hydrated Lime: ASTM C 206, Type S.

B. Portland Cement: ASTM C150, Type I, Lehigh White Cement.
   1. Low-Alkali Cement: Natural color Portland cement shall contain not more than 0.60 percent total alkali when tested according to ASTM C 114.

C. Aggregate: In accordance with PCA Plaster (Stucco) Manual and as required to match existing plaster, where necessary, in profile and gradation.

D. Bonding Materials for Exterior Portland Cement/Lime Plasters: Acrylic based, as recommended by plaster manufacturer.

E. Water: Clean and Potable, free of mineral or organic matter that could adversely affect plaster.

2.02 PLASTER MIXES

A. Portland Cement Plaster Over Masonry:
   1. Trial Mix: Three coat application.
      a. One part Portland Cement, maximum.
      b. Two parts Hydrated Lime, maximum.
      c. Nine parts Aggregate, maximum.

B. Portland Cement Plaster Over Metal Lath:
   1. Trial Mix: Three-coat application.
      a. One part Portland Cement, maximum.
      b. One part Hydrated Lime, maximum.
      c. Six parts Aggregate, maximum.

C. Mix only as much plaster as can be used prior to initial set.

D. Mix materials dry, to uniform color and consistency, before adding water.

E. Do not overmix plaster mortar; over-mixing can cause crazing and discoloration, and can make the mortar set too fast, which will result in cracking and poor bonding or keying to the lath or masonry substrate.

F. Protect mixtures from freezing, frost, contamination, and excessive evaporation.

G. Do not retemper mixes after initial set has occurred.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify and layout the extent of plaster removal required before starting removal.

B. Verify that existing conditions are satisfactory before starting work.

C. Masonry: Verify joints are properly recessed and keyed for plaster installation.

D. Grounds and Blocking: Verify items within walls for other sections of work have been installed.

E. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.

3.02 PLASTER REMOVAL

A. Remove existing exterior field plaster, as indicated.

B. Do not damage masonry substrate.

C. Use hand tools to the extent feasible. Specially designed plaster removal tools, such as hand-held grinders and pneumatic tools, will be allowed when plaster can be removed without damaging the masonry substrate. Each mechanic must demonstrate proficiency in the use of hand held grinders or pneumatic tools before work begins.

3.03 PREPARATION OF SOLID SURFACES

A. Paint, Dirt, Oil, Grease, and Other Foreign Matter: Remove every trace from surfaces to receive new plaster. Remove surface salt deposits as indicated.

B. For Ornamental Plaster, install supplementary temporary and permanent supports, as required for proper installation.

C. Dampen masonry surfaces to reduce excessive suction.

3.04 PLASTERING

A. Apply plaster in accordance with ASTM C 926

B. Three-coat Application:
   1. Apply first coat to nominal thickness of 3/8 inch.
   2. Apply second coat to nominal thickness of 3/8 to 3/4 inch, depending on the shape of the stone.
   3. Apply finish coat to nominal thickness of 1/8 to 1/4 inch.

C. Moist cure base coats. Avoid rapid drying.

D. Apply second coat immediately following initial set of first coat.

E. After curing, dampen previous coat prior to applying finish coat.

F. Finish Texture: Provide a consistent appearance; match appearance of existing texture at location designated by Architect.

G. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.

H. Perform work in panels to nearest natural break or between accessories.

I. Moist cure finish coat for minimum period of 48 hours.

3.05 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Floor underlayment
   1. Plywood substrate
   2. Uncoupling membrane
   3. Corner movement profile

E. Ceramic accessories.

F. Ceramic trim.

G. Setting materials: adhesives, mortars, grouts, and sealants

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Plywood underlayment for ceramic tile flooring.

B. Section 09 2420 - Portland Cement Plaster (Stucco)

1.03 REFERENCE STANDARDS

A. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior glue plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

B. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).

C. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2012 (Revised).

D. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).

E. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

F. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.

G. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.

H. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2013.

I. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

J. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

K. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

C. Samples: Mount tile and apply grout on two 5/8" thick specified tile backer board panels, 24x 48 inches in size illustrating each pattern, color variations, and grout joint size and color variations.

D. Samples: Submit color samples of uncoupling membrane and corner movement profile from manufacturer's standard color range for selection by Architect.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.06 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
   1. Provide 3 foot x 3 foot mock-up of floor tile.
   2. Provide 3 foot wide x wainscot heigh tall mock-up of each wall tile type.
   3. Approved mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products of each type by the same manufacturer.
   1. Dal-Tile Corporation: www.daltile.com/#sle.
   2. Cle: www.cletile.com
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
         1) Size: 2 inch x 6 inch
      b. Inside Corners: Jointed.
      c. Floor to Wall Joints: Flat base.
         1) Size 6 inch x 6 inch
   2. Manufacturers: Same as for tile.

C. Tile Floor Edging:
   1. Manufacturer: Schluter-Systems. www.schluter.com
   2. Product: Schluter-Reno-TK
   3. Material: Anodized Aluminum
   4. Finish: Brushed Antique Bronze
   5. Height as required

D. Corner Movement Profile: Profile with integrated rigid, recycled PVC trapezoid-perforated anchoring legs, connected at a 90-degree angle by a 3/16 inch (5 mm) wide soft CPE movement zone that forms the visible surface.
   1. Application: For all floor-tile to wall-tile transition joints.
   2. Manufacturer: Schluter-Systems. www.schluter.com
   3. Product: Schluter-DILEX-EKE
   4. Profile: As required.
   5. Height: As required.
   6. Color: As selected by Architect.

2.03 UNCOUPLING MEMBRANE

A. Manufacturers:
   1. Schluter-Systems; DITRA; www.schluter.com

B. Product: Schluter-DITRA Uncoupling Membrane
   1. Description: 1/8 inch (3 mm) thick, orange, high-density polyethylene membrane with a grid structure of 1/2 inch x 1/2 inch (12 mm x 12 mm) square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its underside.
   2. Conforms to ANSI A118.10

2.04 SETTING MATERIALS

A. Dry-Set Portland Cement Mortar Bond Coat: ANSI A118.1.

B. Unmodified Thin-Set Mortar Bond Coat:
   1. Applications: Use this type of bond coat where indicated.

2.05 GROUTS

A. Manufacturers:
   1. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: Where indicated.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.

2.06 ACCESSORY MATERIALS

A. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch (12.7 mm) thick; 2 inch (51 mm) wide coated glass fiber tape for joints and corners.

B. Backer Board: Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.

C. Tile Backer Board: Glass Mat Mesh Faced Tile Backer Board, as specified in Section 09 2116 - Gypsum Board Assemblies.

D. Mesh Tape: 2 inch (50 mm) wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. 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 the following limits:
   1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft (7.1 kg per 100 sq m) per 24 hours, test in accordance with ASTM F1869.
   2. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.

E. Verify that required floor-mounted utilities are in correct location.

F. Verify that underlayment is installed according to the uncoupling membrane Manufacturer's recommendation for each type of substrate.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. At walls, install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - UNDERLAYMENT

A. Install tile floor underlayment according to the uncoupling manufacturer's recommendation for each type of substrate indicated.

B. Use uncoupling membrane under all tile floors unless other underlayment is indicated.

3.05 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over concrete substrates, install tile in accordance with The Tile Council of North America Handbook Method TCA Handbook Method F115, with epoxy emulsion grout, unless otherwise indicated.

B. Over wood substrates, install tile in accordance with The Tile Council of North America Handbook Method F142, with standard grout, unless otherwise indicated.

C. Over wood substrate with backer board underlayment, install in accordance with TCNA (HB) Method F144, for cementitious backer boards, with standard grout.

3.06 INSTALLATION - WALL TILE

A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.

B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

3.07 CLEANING

A. Clean tile and grout surfaces.

3.08 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

B. Cover finished floor tile with ramm board, after visual inspection, until project punch out.

3.09 SCHEDULE

A. Room 205 - NB Master Bath
   1. Backsplash Tile: Cle - Cement Tile.
      a. Type: Peabody
      b. Size: 8"x9"x5/8"
      c. Color: Black | White | Wool
      d. Base: not applicable
      e. Installation Method: Mortar bed.
      f. Grout: Unglazed tile grout - Avalanche
   2. Wall Tile: Dal-tile
      a. Type: Annapolis
      b. Size: 6"x16" - wall tile bevel
      c. Color: Matte Sail AP10
      d. Base: not applicable
      e. Installation Method: Mortar Bed.
      f. Grout: Epoxy grout
   3. Wainscot: Cle - Cement Tile.
      a. Type: White Solid Square
      b. Size: 8"x8"x5/8"
      c. Color: White
      d. Base: White Solid Square
      e. Installation Method: Mortar Bed
      f. Grout: Unglazed tile grout - Avalanche
   4. Floor Tile: Cle - Cement Tile.
      a. Edge Tile
         1) Type: White Solid Square
         2) Size: 8"x8"x5/8"
         3) Color: White
         4) Base: White Solid Square
         5) Installation Method: Mortar Bed w/ uncoupling membrane
         6) Grout: Unglazed tile grout - Avalanche
      b. Field Tile
         1) Type: Peabody
         2) Size: 8"x8"x5/8"
         3) Color: Black | White | Wool
         4) Base: not applicable
         5) Installation Method: Mortar bed w/ uncoupling membrane
         6) Grout: Unglazed tile grout - Avalanche

B. Room 207 - NB Bath
   1. Backsplash Tile: Cle - Cement Tile.

a. Type: Honeycomb
b. Size: 8"x9"x5/8"
c. Color: Black | White | Wool
d. Base: not applicable
e. Installation Method: Mortar bed.
f. Grout: Unglazed tile grout - Timberwolf

2. Wall Tile: Dal-tile
a. Type: Annapolis
b. Size: 6"x16" - wall tile bevel
c. Color: Matte Sail AP10
d. Base: not applicable
e. Installation Method: Mortar Bed.
f. Grout: Epoxy grout

3. Wainscot: Cle - Cement Tile.
a. Type: White Solid Square
b. Size: 8"x8"x5/8"
c. Color: White
d. Base: White Solid Square
e. Installation Method: Mortar Bed
f. Grout: Unglazed tile grout - Avalanche

4. Floor Tile: Dal-tile
a. Type: Matchpoint
b. Size: 12x24
c. Color: Pure White P125 - Unpolished
d. Base: not applicable
e. Installation Method: Mortar Bed w/ uncoupling membrane
f. Grout: Epoxy Grout

C. Room 210 - NB Kitchen
1. Backsplash Tile: Cle - Cement Tile.
a. Type: Radar Hexagon
b. Size: 8"x9"x5/8"
c. Color: White (Background) Wool (Stripes)
d. Base: not applicable
e. Installation Method: Mortar bed.
f. Grout: Unglazed tile grout - Timberwolf

D. Room 214 - SB Bath
1. Backsplash Tile: Cle - Cement Tile.
a. Type: Big Al
b. Size: 8"x8"x5/8"
c. Color: Federal blue | Nautical blue | White
d. Base: not applicable
e. Installation Method: Mortar bed.
f. Grout: Unglazed tile grout - Timberwolf

2. Wall Tile: Dal-tile
a. Type: Annapolis
b. Size: 6"x16" - wall tile bevel
c. Color: Matte Sail AP10
d. Base: not applicable
e. Installation Method: Mortar Bed.
f. Grout: Epoxy grout

3. Wainscot: Cle - Cement Tile.
a. Type: White Solid Square
b. Size: 8"x8"x5/8"

c. Color: White
d. Base: White Solid Square
e. Installation Method: Mortar Bed
f. Grout: Unglazed tile grout - Avalanche

4. Floor Tile: Dal-tile
a. Type: Matchpoint
b. Size: 12x24
c. Color: Pure White P125 - Unpolished
d. Base: not applicable
e. Installation Method: Mortar Bed w/ uncoupling membrane
f. Grout: Epoxy Grout

E. Room 220 - SB Kitchen
1. Backsplash Tile: Cle - Cement Tile.
a. Type: Hedron
b. Type: Annapolis
c. Size: 6"x16" - wall tile
d. Size: 8"x9"x5/8"
e. Color: White (Background) Wool (Stripes)
f. Color: Matte Sail AP10
g. Base: not applicable
h. Base: not applicable
i. Installation Method: Mortar bed.
j. Installation Method: Mortar Bed.
k. Grout: Epoxy grout
l. Grout: Unglazed tile grout - Timberwolf

SECTION 09 4400

THIN-SET TERRAZZO FLOORING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Epoxy matrix terrazzo floor.

B. Epoxy terrazzo Base

C. Divider strips.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. National Terrazzo and Mosaic Association - Terrazzo Color Palette.

B. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 1996.

C. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 1996a.

1.04 SYSTEM DESCRIPTION

A. Thin-Set Terrazzo, 1/4-3/8 inch in thickness, comprised of the following components:
   1. Low viscosity, low modulus epoxy primer as recommended by the manufacturer to achieve the bonding properties required.
   2. Terrazzo Matrix binder resin.
   3. Marble chips, sized for finished thickness.
   4. Divider strips of brass.
   5. Seal Coat.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for divider strips, control joint strips, and expansion joints; include printed copy of current NTMA recommendations for type of terrazzo involved.

C. Shop Drawings: Indicate divider strip and control joint layout, and details of adjacent components.

D. Samples: Submit two samples, 24x24 inch in size illustrating color, chip size and variation, chip gradation, matrix color and typical divider strip.

E. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.

1.06 QUALITY ASSURANCE

A. Manufacturer: Obtain all resinous components for flooring system from a single company specializing in manufacturing the products specified in this section and with not fewer than 10 years of documented experience.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.

C. Certification
   1. Manufacturer shall furnish certification attesting that materials meet specification requirements.
   2. Manufacturer shall furnish properly labeled material and Material Safety Data Sheets which comply to current state and federal requirements.

D. Installer's Qualifications: A company certified in writing by the flooring system manufacturer, having skilled mechanics with not fewer than three years of satisfactory experience in installation of flooring systems of the type specified in this section.
   1. Furnish a list of similar flooring projects installed within the previous 10 years. Include project name, area of terrazzo flooring actually installed, and contact information.

2. Furnish resumes of key project personnel, detailing relevant experience.

E. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.

F. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 10 years of documented experience.

G. Pre-Construction meeting between Contractor, Architect, and installer shall be held to discuss substrate, location of joints and/or saw cuts to minimize sub-floor cracking and locations of control joints and strips in terrazzo surface.

1.07 MOCK-UP

A. Provide 1 mock up, 4 feet long by 4 feet wide, illustrating finish levels.

B. Mock-up may remain as part of the Work.

C. Unacceptable installed work to be removed and replaced or refinished until acceptable.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered to project site in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.

B. Store resin materials in a dry, secure area.

C. Maintain minimum temperature of 55 degrees F.

D. Keep products away from fire or open flame.

1.09 SUBMITTALS

A. Shop Drawings: Shop Drawings shall be furnished showing installation of cove base and termination detail, and details at floor material transitions and abutting adjoining equipment.
   1. Locate and provide detailing for joints required of flooring in area of installation.
   2. Installer to verify locations of all flexible joints required by the provisions of this Section and by the recommendations of the related material manufacturers.
      a. Joint locations are required whether shown or not in Contract drawings.

B. Selection Samples:
   1. Submit three samples, 6 inches by 6 inches for each color and type of terrazzo available from manufacturer's full range.
   2. Submit two 6-inch lengths of each type and kind of divider strips available.

1.10 FIELD CONDITIONS

A. Ambient Conditions: Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.

B. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.

C. Provide ambient lighting level of 50 ft candles, measured at floor surface.

1.11 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide warranty signed by manufacturer and installer, agreeing to repair or replace defective materials within a period of one year after Date of Substantial Completion. Defective materials shall include polyacrylate terrazzo that has lost bond to substrate and areas that have worn through to substrate with normal use.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Terrazzco, 1818 University Commercial Pl, Charlotte, NC 28213, TEL: 704-921-4928, Fax: 980-321-5220 Email: info@terrazzco.com Web: www.terrazzco.com.

B. Thin set Epoxy Terrazzo.
   1. Basis of Design: TERRAZZCO® EZpour Epoxy 158
      a. www.terrazzco.com
   2. Substitutions: See Section 01600 - Product Requirements.

2.02 PLASTIC MATRIX TERRAZZO

A. Floors: Epoxy matrix, 3/8 inch thick.
   1. Matrix Color: As selected.
   2. Aggregate Color: As selected.

2.03 MATERIALS

A. Epoxy Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.

B. Aggregate: Crushed marble, size in accordance with NTMA Plate of standard gradation and uniform coloration.
   1. For trial mixes, provide aggregates resembling appearance of selected resilient terrazzo tiles.

2.04 ACCESSORIES

A. Divider Strips: 1/8 inch thick stainless steel exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.

B. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.

C. Base Cap, stainless steel Divider Strip, and Separator Strip: Match divider strips.

D. Cleaner: Neutralizing liquid type, pH of 7.

E. Sealer: Colorless, slip and stain resistant which will not detrimentally affect terrazzo and adjacent work. Provide product equivalent to VIC as manufactured by PSI.
   1. USA Source:
      a. GranQuartz Stone Care Systems
      b. 4963 South Royal Atlanta Dr.
      c. Tucker, GA 30084 d. 1-866-639-0960
      d. www.granquartz.com <http://www.granquartz.com/>

2.05 MATERIALS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive terrazzo.

C. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for terrazzo installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
   1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.

2. Alkalinity: pH range of 5-9.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare concrete substrate to receive thin-set epoxy terrazzo by removing laitance and opening surface.

B. Achieve surface profile of concrete similar to medium grit sandpaper, free of bond-inhibiting contaminants, by means of light brush grit blasting.

C. Repair non-moving cracks in substrate with semi-rigid epoxy, complying with General Polymers concrete filler 102.

D. Prepare edge conditions in accordance with approved shop drawings.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions

B. Provide accessories necessary for complete installation.

C. Backing for epoxy terrazzo base shall be exterior grade plywood

D. Prime subfloor in accordance with resin manufacturer's instructions

E. Saw cut substrate to install divider and control joint strips.

F. Install divider and control joint strips straight and level to locations indicated.

G. Place terrazzo mixture and trowel to a dense flat surface to top of divider strips.

H. Install non-slip inserts in floors where needed.

I. Install base divider and control joint strips to match floor pattern.

J. Place terrazzo mix over prepared substrate to thickness indicated.

3.04 CURING

A. Cure terrazzo topping by sheet polyethylene curing method.

B. Close area to allow undisturbed curing.

3.05 FINISHING

A. Finish terrazzo to NTMA requirements.

B. Produce terrazzo finish surface to match approved mockup, with 70 percent chip exposed.

C. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method.

D. Apply grout mix matching mortar to fill honeycomb exposed during grinding process. Grind with 80 grit or finer abrasive until all grout is removed from the surface. Match sheen of approved samples.

E. Rough Grinding:
   1. Grind with 24 or finer grit stones or with comparable diamond plates.
   2. Follow initial grind with 80 or finer grit stones.

F. Grouting
   1. Cleanse floor with clean water and rinse.
   2. Remove excess rinse water, dry, and apply epoxy grout, supplied by epoxy manufacturer, to fill voids.
   3. Grout may be left on terrazzo until all heavy and messy work in project is completed

G. Fine Grinding
   1. Grind with 80 or finer grit stones until all grout is removed from surface.

H. Hand grind base similarly.

3.06 TOLERANCES

A. Maximum Variation from Flat Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.07 CLEANING AND SEALING

A. Terrazzo Cleaner:
   1. pH factor between 7 and 10.
   2. Biodegradable and phosphate free.

B. Sealer:
   1. pH factor between 7 and 10.
   2. Sealer shall not discolor or amber.
   3. Flash Point: ASTM D 56, 80 degrees F (27 degrees C) minimum.
   4. Special stain and/or chemical resistant sealers shall be used for areas requiring resistance to iodine or Betadine.

C. Scrub and clean terrazzo surfaces with cleaner in accordance with manufacturer's instructions. Let dry.

D. Immediately after terrazzo has dried, apply sealer in accordance with manufacturer's instructions.

E. Seal and polish surfaces, in accordance with manufacturer's instructions.

3.08 PROTECTION

A. Protect epoxy terrazzo surfaces from damage and wear during remaining construction period, using temporary coverings as recommended by the manufacturer.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. Upon completion, the work shall be ready for final inspection and acceptance by the architect

D. Touch-up, repair or replace damaged products before Substantial Completion.

3.09 PROTECTION

A. Protect installed terrazo floor from damage from subsequent construction operations.

END OF SECTION

SECTION 09 5425
METAL CEILING PRESERVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Repair, patching/restoration of historic stamped metal ceiling, as indicated.
   1. Removal of existing metal ceiling tiles and accessories.
   2. Repair of salvaged metal ceiling.
   3. Reinstallation of salvaged metal ceiling, as indicated.

1.02 RELATED REQUIREMENTS

A. Section 09 9005 - Finish Removal.

B. Section 09 9010 - Interior Paints and Coatings.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

B. NPS Technical Preservation Services Preservation Brief 49: Historic Decorative Metal Ceilings and Walls: Use, Repair, and Replacement; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.06 MOCK-UP

A. Construct mock-up of salvaged metal ceiling system, minimum 4 feet by 4 feet, including suspension system, field, filler, and cornice or trim components, and fasteners.

B. Locate mock-up where directed.

C. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Salvaged historic material shall be carefully packed and stored under cover and in the building away from work or traffic areas. Mark salvaged material, carefully documenting the existing layout with numbering, to aide in their reinstallation.

PART 2 PRODUCTS

2.01 SALVAGED METAL CEILINGS

A. Salvaged historic metal ceilings, as indicated:
   1. Field, filler, and cornice/trim components.

2.02 ACCESSORIES

A. Furring strips, as required.

B. 1-inch long flat head nails, as required.

C. Wood shims, as required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 REPAIR OF METAL CEILING COMPONENTS

A. Carefully remove all existing metal ceiling components and accessories, as indicated.

B. Prior to removal, thoroughly document existing installation with photographs.

C. Measure and label all ceiling tiles and components, to aid in proper reinstallation.
   1. Pieces should be marked in such a way that the labels remain legible throughout the cleaning and reinstallation process.

D. Remove/strip existing paint from salvaged metal ceiling components. Reference Section 09 9005 - Finish Removal.
   1. For surfaces known to contain lead, Contractor shall comply with all applicable County, State and Federal regulations regarding preparation of surfaces containing lead and disposal of lead containing debris.

3.03 INSTALLATION

A. Install salvaged metal ceiling after above-ceiling work is complete.

B. Nail furring strips to the ceiling, as required for proper reinstallation of salvaged metal ceiling components. Nail the strips as far from the wall as the cornice will project.
   1. Nail the strips as far from the wall as the cornice will project.
   2. Only drive the nails in halfway to allow for later shimming and leveling.
   3. Marking lines need to be precisely located as the metal sheets are rigid and cannot be adapted to nonparallel nailing strips.

C. Install salvaged metal panels, as indicated.
   1. Generally, the cornice is installed after the ceiling field and filler panels are in place.
   2. Fill any open joints with glazing compound or latex caulk.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 09 6410
WOOD FLOORING PRESERVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preservation of existing wood strip and plank flooring, nailed.

B. Installation of preserved salvaged wood joists for stair treads and landings.

C. Surface finishing.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry.

B. Section 09 3000 - Tiling: Adjacent floor finish with edging abutting wood strip flooring.

C. Section 09 9000 - Painting and Coating: Surface finish to flooring.

D. Section 09 9005 - Finish Removal.

1.03 REFERENCE STANDARDS

A. NOFMA (IN) - Installing Hardwood Flooring; National Oak Flooring Manufacturers Association; current edition located at www.nofma.org.

B. NWFA - Installation Guidelines and Methods; National Wood Flooring Association; current edition located at www.nwfa.org.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for floor finish material and repair material.

C. Maintenance Data: Include maintenance procedures.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this section with minimum five years experience.

1.06 MOCK-UP

A. Provide one (1) 36x48 inch mock-up of refinished salvaged wood strip flooring showing polyurethane sealer, no stain finish.
   1. Install entire length of wood boards.
   2. Include example of hole repair with wood plug/dutchman.

B. Provide three (3) 36x48 inch mock-up of refinished salvaged wood strip flooring, one for each type of stain finish, as selected by Architect.
   1. Install entire length of wood boards.
   2. Include example of hole repair with wood plug/dutchman.

C. Provide mock-up of one tread from refinished salvaged wood joist.

D. Mock-up may remain as part of work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood putty:
   1. Abatron, Inc. http://www.abatron.com/
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Wood stains and sealers:
   1. Bona. www.bona.com
   2. Benjamin Moore. www.benjaminmoore.com
   3. Cabot. www.cabotstain.com

4. Sherwin Williams. www.sherwin-williams.com
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Stain: To be determined by samples, as selected by Architect.

B. Wood for dutchman repair (plug) of holes through existing wood strips and planks
   1. New wood should match existing material to be repaired in color, character, and grain direction.

C. Commercial wood putty, colors-in-oil or oil stain pigment to color putty to match existing floor finish.

D. Flooring Nails: Steel cut finishing nails.
   1. Tremont Nail Company. www.tremontnail.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Remove flooring as indicated on Drawings as required to install structural framing reinforcement. Examine and salvage all lumber that can be reused.

C. Verify that subfloor is properly secured, smooth and flat to plus or minimum 1/4 inch in 10 feet.

3.02 PREPARATION

A. Broom clean substrate.

B. Repair damaged and defective existing flooring wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

C. Repair holes, gouges, cracks, checks, dings, and discolored areas (dark) using a wood putty mixture compounded of glue and sawdust from wood of the type being repaired. Where directed by Architect for specific category of minor defects, leave defect unfilled; smooth and lightly sand edges to make less obtrusive in the finished work.

D. Wood Replacement: Remove and discard damaged portion and cut and fit in a matching portion using scarf joint. Where wood is damaged beyond practical repair by the indicated method, Contractor may elect with approval of Owner's representative to remove the entire part (such as an entire plank) and provide a salvaged matching part. Where portions are indicated to be removed and salvaged portions provided, the salvaged portion shall be the entire portion (entire plank for example). Do not splice members. Where entire members have been removed and salvaged members provided, provide joint reinforcements where salvaged and existing, or two salvaged, members join. Retain and match existing woodwork joinery configurations adapting only as required to incorporate joint reinforcements and adhesive. Retain and match existing woodwork joinery configurations adapting only as required to incorporate joint reinforcement and adhesive. Match color and character of existing varnished wood.

E. Criteria for Repair of Separated Joints: Repair cracks and gaps greater than the sizes listed in the schedule below by partial or complete rebuilding or replacement of parts as indicated:
   1. Gap between vertical edges of faces: 3/64" x 8% of joint length
   2. Intersecting joint gap: 1/32" x 30% of joint length
   3. Longitudinal gap between molding and face: 3/64" x 8% of joint length

F. Holes larger than 3/8" in any surface dimension (including holes through board): Install wood plugs or "Dutchman". Match color, character, and grain direction of existing wood.
   1. Glue plug into the cavity with wood glue. Allow glue to dry, then sand if necessary and refinish to match surrounding floor, as indicated.

3.03 INSTALLATION

A. Wood Strip Flooring:
   1. Install in accordance with MFMA, NOFMA, and manufacturer's instructions; predrill and blind nail to sleepers.
      a. Minimize shortness of length of salvaged pieces.
      b. Avoid sharing nails.
   2. Lay flooring perpendicular to joists and parallel to length of room areas. Verify alignment as work progresses.
   3. Arrange flooring with end matched grain set flush and tight.
   4. Install flooring tight to floor access covers.
   5. Provide 1/4 inch expansion space at fixed walls and other interruptions.

B. Finishing:
   1. Mask off adjacent surfaces before beginning sanding.
   2. Sand flooring using course, medium and fine sandpaper in sequence, to smooth even finish with no evidence of sander marks. Take precautions to contain dust. Remove dust by vacuum.
   3. Apply filler and finish in accordance with floor finish manufacturer's instructions
   4. Apply four finish coats consisting of two coats of specified sealer and two coats of specified finish.
   5. Apply first coat, allow to dry, then buff lightly with steel wool to remove irregularities. Vacuum clean and wipe with damp cloth before applying succeeding coat.
   6. Lightly buff between coats with steel wool and vacuum clean before applying succeeding coat.
   7. Apply last coat of finish.

C. Floor Access Covers: Install floor access covers specified in Section 16130 in accordance with cover manufacturer's installation instructions.

3.04 CLEANING

A. Clean and polish floor surfaces in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Place protective coverings over finished floors; do not remove coverings until Substantial Completion.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, varnishes, and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically so indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide a complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category.
   2. Cross-reference to specified paint system(s) that the product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

1.05 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, feet long by 1 feet wide, illustrating special coating color, texture, and finish.

C. Locate where directed.

D. Mock-up may remain as part of the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Benjamin Moore & Co: www.benjaminmoore.com/#sle.

C. Transparent Finishes:
   1. Behr Process Corporation: www.behr.com/#sle.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

D. Stains:
   1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each coating material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
   1. Gypsum Board: Interior Latex Primer Sealer; MPI #50.
   2. Plaster: Interior Latex Primer Sealer; MPI #50.

C. Volatile Organic Compound (VOC) Content:
   1. Provide coatings that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - All Exterior Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry, and cement board.
   1. Preparation as specified by manufacturer.
   2. Two top coats and one coat primer recommended by manufacturer.

B. Paint E-TR-W - Stain on Wood, Unless Otherwise Indicated:
   1. 2 coats stain.

C. Paint WE-TR-S - Wood, Transparent, Sealer, Optional Stain:
   1. One coat of stain; .
   2. One coat of clear sealer; .

D. Paint GE-OP-3L - Gypsum Board and Plaster, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer.
   2. Flat: Two coats of latex; ____.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

G. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied. Prime concealed surfaces.

3.02 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.03 SCHEDULE - PAINT SYSTEMS

A. Plaster and Gypsum Board: Finish all surfaces exposed to view.
   1. Exterior Walls (Stucco): Benjamin Moore - 1486 - Winterwood
   2. Interior Walls: Benjamin Moore - Ben Moore - 856 - Silver Satin
   3. Interior trim: Benjamin Moore -
   4. North building exterior cornice Primary color: Benjamin Moore - 2139-50 - Silver Marlin
   5. North building exterior cornice secondary color: Benjamin Moore - 1606 - Cobblestone Path
   6. North building window sills: Benjamin Moore - 1606 - Cobblestone Path

B. Wood: Finish all surfaces exposed to view.
   1. Wood floors: Cabot semi transparent stain, Capecod grey
   2. Interior storefront doors: Benjamin Moore - 1617 - Cheating Heart
   3. Interior Window sash and frames: Benjamin Moore - 1617 - Cheating Heart

C. Wood Cabinets: Finish all exposed and semi-exposed surfaces.
   1. Kitchens, bathrooms, and reclaimed shelving: Miniwax Wood Penetrating Stain and Polyurethane Varnish.

D. Metal
   1. Metal Ceiling: Benjamin Moore - 1613 - Silent Night

END OF SECTION

SECTION 09 9005

FINISH REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Paint and Coating Removal.
   1. From indicated wood materials.
   2. From indicated metal items.
   3. From indicated interior plaster walls.

1.02 RELATED SECTIONS

A. Section 01 5000 - Temporary Facilities and Controls: Protection of the public and surrounding property.

B. Section 04 0510 - Masonry Restoration and Cleaning.

C. Section 08 5250 - Window and Door Preservation.

D. Section 09 5425 - Metal Ceiling Preservation.

E. Section 09 2100 - Interior Plaster Preservation.

F. Section 09 9010 - Interior Paints and Coatings: Minimum surface preparation for previously painted surfaces where paint is not indicated to be removed.

1.03 PERFORMANCE REQUIREMENTS

A. Criteria for Finish Removal: Surface preparation is required as a minimum on every surface to produce substrate conditions complying with manufacturer's recommendations for successful subsequent application and optimum adhesion of specified penetrating treatments, attachment adhesives, or coating system requirements. Refer to referenced sections for manufacturer's requirements for suitability of substrate for application of finishes.

B. Perform surface preparation for exposed surfaces designated for finish removal and subsequent painting/coating to the extent not indicated as work of another section.

C. For surfaces known to contain lead, Contractor shall comply with all applicable County, State and Federal regulations regarding preparation of surfaces containing lead and disposal of lead containing debris.

D. Specific finish removal materials described herein are not based on exhaustive investigations by the Architect, but are believed to be effective for purposes described. Other methods may be used, subject to demonstration of effectiveness by the Contractor and written representation by the Contractor that substrate from which finish will be removed is not damaged, adjacent building materials can be adequately protected, and finish removal residues can be legally disposed of.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each type of product indicated.

1.05 QUALITY ASSURANCE

A. Manufacturer of primary finish removal products, materials, or systems to be provided shall be a firm which has produced the type(s) of products required on the project not less than five years, and which employs a qualified technical person capable of functioning as a field representative to assist the Contractor and advise the Owner regarding proper use and application of the specified materials on this Project and who is available periodically to provide specific quality assurances as indicated in the Contract Documents.

B. Installer shall possess and be capable of properly utilizing specialized equipment where applicable. Installer shall be acceptable to the manufacturer of specified materials or systems required in the Work. Workers shall be skilled finish removal technicians and experienced in the type of work required.

1.06 MOCK-UP

A. Provide mock-ups as indicated, on actual substrate, for Architect's review. Define each separate coat remove step and level of finish removal achieved.
   1. Provide a list of material and application for each coat of each sample. Label each sample.
   2. Prepare mock-ups on the following substrates:
      a. Painted Wood: Provide two 6" x 6" samples of paint removal on wood trim.
      b. Metal Ceilings: Provide one 2' x 2' sample of paint removal on ceiling field tile.

1.07 PROJECT CONDITIONS

A. Unless otherwise acceptable to the governing authorities, employ wet removal methods and legally dispose of paint residues off-site.

B. Perform stripping and removal operations on or off-site as applicable. For transparent finish wood materials, including painted over doors, use non-caustic hydroxide free solvents, only. Abrasive blasting and power tool removal methods are prohibited on wood and metal surfaces. Use of open flames for stripping operations is prohibited.

C. Do not use pressure water rinsing in the interior of the building.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Ventilation: Provide fresh air movement continuously through areas being stripped with chemical products.

B. Provide proper application/installation of masking materials. Eliminate pin holes or gaps which would allow the cleaner to "get behind" the protective surface and cause damage to exposed areas.

C. Protecting Glass and Metal Surfaces: Protect glass and metal surfaces to prevent "etching" of the surface or oxidation of metallic surfaces, unsightly discoloration of the metal, and rust formation.
   1. Glass and metal surfaces shall be protected from exposure to strong cleaning products with polyethylene film or other proven protective material. Metal and glass surfaces shall be completely covered with the polyethylene and masking tape used to seal off the edges of the polyfilm.
   2. Non-porous surfaces such as glass and metal may also be protected with liquid masking materials at Contractor's option. These materials shall be applied to the surface to be protected and removed after the cleaning operation is completed.
   3. Liquid masking material shall be thoroughly pre-tested for chemical resistance to strong cleaners.

D. Protecting Wood and Painted Surfaces: Wood and painted surfaces which are to be preserved shall be protected from exposure to the chemical cleaning products.
   1. Wood and painted surfaces shall be protected with sheets of polyethylene or other proven protective material. Surfaces to be protected should be completely covered with the polyethylene and chemical resistant masking tape used to seal off the edges of the polyfilm.

E. Information regarding removal/disposal of paint residues may be obtained by contacting the Texas Department of Health, Ph: 512/458-7269.

F. Comply with governing authorities for removal and disposal of removed finish residues.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable chemical paint remover product for removal of finishes from wood, metal, and plaster surfaces:
   1. "Peel Away "; Dumond Chemicals, Inc., of a strength and composition appropriate for each finish surface. www.dumondchemical.com
      a. Phone: 212/869-6350

b. Fax: 212/398-0815

2. "Paintbusters Brand Architectural Stripper"; On Site Wood Restoration; Cincinnati, Ohio. Note: Non-caustic product believed to be suitable for transparent finish wood surfaces.
   a. Phone: 513/541-4545
3. "Dad's Easy Spray Paint & Varnish Remover"; Sansher Corp.
   a. Fort Wayne, Indiana

2.02 CLEANING MATERIALS AND EQUIPMENT:

A. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.

B. Warm Water: Heat water to temperature of 140 deg. F-180 deg. F (60 deg. C-82 deg. C) where required to facilitate proper rinsing.

C. Brushes: Fiber bristle only.

D. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, if any, at rates indicated for pressure, measured at spray tip, and for volume.
   1. For spray application of water, provide fan-shaped spray-tip which disperses water at angle of not less than 40 degrees at pressures not to exceed pressures indicated at a rate not less than 4-6 gallons per minutes.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect persons, motor vehicles, surround surfaces of building whose surfaces are being restored, building site, and surrounding buildings from injury resulting from restoration work.
   1. Prevent chemical solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings and other surfaces which could be injured by such contact.
   2. Do not clean exterior surfaces during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
   3. Dispose of run-off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of flooring and foundations, damage to finishes to remain, and water penetration into building structure or damage to roof surface, gutters, downspouts, stonework.
   4. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of finish removal work.

3.02 APPLICATION

A. Spray equipment shall be handled with due care in accordance with the manufacturer's recommendations. When using or handling spray equipment, hoses and the like, observe all required safety practices.

B. Use proper safety equipment for protecting the body, hands, and eyes of the operator. Perform operation of such pressure equipment with adequate guidance and supervision of experienced personnel.

C. Comply with recommendations of manufacturers of chemical cleaners for protecting building surfaces against damage from exposure to their products where more stringent than specified herein.

D. Apply as many coats of paint remover as necessary to remove paint and coatings down to indicated sound substrate. Test substrates periodically and provide a neutralizing chemical in the final rinse as required to produce a neutral surface to receive specified paint or coating.

END OF SECTION

SECTION 10 2800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

1.02 RELATED REQUIREMENTS

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Samples: Submit one samples of each accessory, illustrating color and finish.

D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.04 COORDINATION

A. Coordinate the work with the placement of internal wall reinforcement and receive anchor attachments

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Refer to Drawings for locations and mounting conditions.

B. Residential Bath Accessories:
   1. Atlas Homewares: www.atlashomewares.com
   2. Ketcham: www.ketchamcabinets.com
   3. Alno, Inc: www.alnoinc.com
   4. Substitutions: Section 01 6000 - Product Requirements.

2.02 RESIDENTIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, Brushed Nickel.
   1. Products:
      a. ATLAS: PARKER: PATR-BRN.
      b. Substitutions: Section 01 6000 - Product Requirements.

B. Double Towel Bar.
   1. Products:
      a. ATLAS: PARKER: PADTB600-BRN
      b. Substitutions: Section 01 6000 - Product Requirements.

C. Hand Towel Ring.
   1. Products:
      a. ATLAS: PARKER: PATR-BRN
      b. Substitutions: Section 01 6000 - Product Requirements.

D. Robe Hook.
   1. Products:
      a. ATLAS: PARKER: PASH-BRN
      b. Substitutions: Section 01 6000 - Product Requirements.

E. Medicine Cabinet, Rectangular.
   1. Products:
      a. KETCHAM: MIRROR: 121-SM
      b. Substitutions: Section 01 6000 - Product Requirements.

F. Medicine Cabinet, Recessed, Oval.

1. Products:
   a. Signature Hardware - www.signaturehardware.com
      1) Type: Taussig
      2) Shape: Oval
      3) Size: 20"x30"
      4) Frame: Frameless
   b. Substitutions: Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.
   1. Provide toggle bolts, molly bolts, or other substantial mounting on masonry walls. Direct screw or plastic anchors are not permitted.
   2. Through bolt accessories attached to toilet partitions with sex bolts or equivalent

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers and Accessories:
   1. Basis of Design: Ansul, a Tyco Business; Cleanguard: www.ansul.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Larsen's Manufacturing Co; _____: www.larsensmfg.com/#sle.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 5 pound (2.27 kg) min.
   3. Temperature range: Minus 40 degrees F (Minus 40 degrees C) to ___ degrees F (___ degrees C).

2.03 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install extinguisher 48 inches from finished floor to bottom of extinguisher.

C. Secure rigidly in place.

END OF SECTION

SECTION 10 5500
POSTAL SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Central mail delivery boxes.

1.02 REFERENCE STANDARDS

A. 39 CFR 111 - U.S. Postal Service Standard 4C; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Samples: Submit two sets of manufacturer's available colors.

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty against defects in materials or workmanship for a period of 5 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CENTRAL MAIL DELIVERY BOXES

A. Wall-Mounted Mailboxes: Fully-recessed, complying with 39 CFR 111 (USPS-STD-4C).

1. Unit A: Front-loading with master door, single-column design, 3 customer compartments, 1 outgoing mail compartment, and 1 parcel compartment.
    a. Florence Manufacturing Company; Model 4CADS-03CS.

2.02 COMPONENTS

A. Locking - Front Loading Master Door: Three-point latching mechanism with USPS master lock furnished and installed by postmaster.

B. Locking - Customer Compartment Doors: USPS approved cam lock, 3 keys each lock.

C. Locking - Parcel Compartment Doors: Double-lock arrangement with USPS approved cam lock for customer access, and USPS master lock furnished and installed by postmaster.

D. Identification - Customer and Parcel Compartments: Sequential numerical or alphabetic characters, top to bottom, left to right; factory-installed.

E. Finish: Powder Coated, Postal Grey (PG)

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough-openings are ready to receive wall-mounted units.

B. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

A. Install postal specialties in accordance with approved shop drawings, manufacturer's instructions, and USPS requirements.

B. Adjust and lubricate door hardware to operate properly.

END OF SECTION

SECTION 10 7300

ROMAN CABLE TRELLIS SHADE

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Cash, testing, and contingency allowances.

B. Section 01 2300 - Alternates: Descriptions of items, administrative requirements.

C. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

D. Section 01 4000 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.

E. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.02 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 2100 - Allowances, for cash allowances affecting this section.

B. Alternates: See Section 01 2300 - Alternates, for product alternatives affecting this section.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide Manufacturer's Product data .

C. Shop Drawings: Indicate Indicate materials, sizes, anchorage and installation details for trellis system..

D. Samples: Submit two 2"x2" fabric samples, illustrating fabric color selection, texture, and openness factor.

E. Manufacturer's installation instructions.

F. Special manufacturer Warranties.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Verify measurements in field prior to ordering.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in manufacturer's original packaging, and protect from dust and damage under cover and elevated above grade.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 10 year manufacturer warranty for all components.

PART 2 PRODUCTS

2.01 RETRACTABLE SHADE CLOTHE SYSTEM SYSTEM

A. Basis of Design Manufacturer: ShadeSails.com llc.

2216 Padre Blvd. Suite B #77

South Padre Island, TX 78597

www.shadesails.com

B. Basis of Design system New Wave Shade Version 3

2.02 MATERIALS

2.03

A. Shade Cloth
   1. Basis of Design: SHADE VIEW 300 MESH Shade cloth covering and associated hangers.
      a. Fire retardant
      b. 5% openness fabric
      c. Mildew resistant
      d. Fade resistant
      e. 10 year warranty

B. Clips
   1. Basis of Design: Duplex grade 2205 stainless steel clips

C. Pipe Spreaders
   1. Basis of Design: Powder coated aluminum pipe spreaders (including joiner) with Plastic endcaps

D. Cable
   1. Stainless steel cable

E. Turnbuckle for tensioning the cable.
   1. Toggle Style Stainless 5/16″ (8mm)Turnbuckle

F. Retracting pull cord and pad eyes - OR- Pole retraction kit.

2.04 SOURCE QUALITY CONTROL

A. Provide all shade system components from a single manufacturer's system

PART 3 EXECUTION

3.01 INSTALLERS

A. Use installer with at least 3 years of experience installing similar shading systems

3.02 EXAMINATION

A. Ensure adequate tension in trellis guide wires per manufacturer's recommendations

B. Reject any damaged or soiled components.

3.03 PREPARATION

A. Thread opening in steel trellis to receive trellis mounting hardware.

3.04 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.05 TOLERANCES

A. If the shade is sliding between two faces or beams etc., allow up to at least 1" tolerance each side of the shade.

B. Determine maximum drop of shade cloth to be at least 7'6" off of the finished surface of the deck

C. Billow
   1. Provide shades with a deep billow

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect for tears defects or damage prior to instalation.

3.07 SYSTEM STARTUP

A. Adjust for proper operation within manufacturer's published tolerances.

3.08 ADJUSTING

A. Adjust hardware and cable tension for smooth operation.

3.09 CLEANING

A. Clean awnings to achieve factory new apperance.

3.10 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of system.

3.11 PROTECTION

A. Protect installed shade system from subsequent construction operations.

END OF SECTION

SECTION 10 7313

AWNINGS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. American Welding Society

B. Industrial Fabric Association International

C. National Fire Protection Agency

D. Society of Protective Coatings

E. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

1.02 DESIGN REQUIREMENTS

A. Material: Black - Sunbrella Black #4608

B. Fabric at sloped and vertical front panels and ends.

C. awning vendor to feild verify awning dimensions and confirm design with PM prior to construction.

D. 1" square extruded aluminum tube frame - mill finish.

E. Frame mounting brackets spaced every 2'-0" top

F. Use two anchor bolts per frame mounting bracket.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on awning covering, color fastness, stitching and seaming methods, attachment devices to framing system, and _____.

C. Shop Drawings: Indicate awning profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

D. Samples, Covering: Submit 12 by 12 inch (300 by 300 mm) sample of covering with representative hem stitch detail, seam with reinforcement, and attachment devices to framing system.

E. Provide color card showing available steel stitch - Sunbrella - Zip Strip - Colors.

1.04 WARRANTY

A. Awning system:
   1. Aluminum frame and fabric attachment warranted for five (5) years by awning manufacturer.
   2. Fabric shell be warranted for a minimum of five (5) years by fabric manufacturer.
   3. Labor for defective fabric replacement shall be warranted for one (1) year.

1.05 MAINTENANCE

A. Upon installation, awnings are to be clean and free of any substance that may discolor or damage fabric or aluminum surfaces. Written cleaning instructions from fabric manufacturer will be made available. Damaged fabric panels will be replaced individually on the jobsite.

PART 2 PRODUCTS

2.01 ALUMINUM FRAMING SYSTEM

A. Framing: 1 inch (25.4 mm)diameter, tubing, complying with ASTM B241/B241M.

B. Framing structure to be of 6063-T5 aluminum extrusions.

C. Fittings: Elbows, T-shapes, wall brackets; cast aluminum.

D. Mounting: Brackets and flanges, with aluminum inserts for embedding into masonry.

E. Splice Connectors: Concealed spigot; cast aluminum.

F. Finish Exposed Components: Mill finish to _____ color.

2.02 COVERING MATERIALS

A. Lacing: Woven nylon.

2.03 FABRICATION - FRAMING

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. All frame members to be joined by welding in compliance with ASW standards.

D. Welds to be 1/4" fillet welds, welded with 4043 aluminum welding rod.

E. Remove all burrs from cut edges.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.04 FABRICATION - COVERING

A. Manufacture covering in one piece wherever possible, sized and configured to suit framing.

2.05 SUBSTITUTIONS

A. Requests for substitutions will be considered.

PART 3 EXECUTION

3.01 INSTALLATION - FRAMING

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide anchors required for connecting framing to structure. Anchor framing to structure.

3.02 INSTALLATION - COVERING

A. Install covering over framing members, stretched taut without creases or folds.

B. Attach covering and fasten securely.

END OF SECTION

SECTION 10 7600

PRE FAB SOLID GLASS PAVER AND PRECAST CONCRETE PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Glass paver and precast concrete panels to match existing, at areaways, see Civil for locations.

B. Reinforcement, anchors, fasteners, and similar items.

C. Glazing materials and sealant for panels

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: The completed panel shall be capable of supporting a live load of not less than 100 pounds per square foot supported on four sides and AASHTO HS-20.

B. Thermal Movement: Framing system to provide for such expansion and contraction of component materials as will be caused by the outside temperature range of -10 degrees F to 120 degrees F, without causing excessive buckling stress on glass pavers, failure of joint sealers, undue stress on structural elements, damaging loads on fasteners, reduction in performance, or other detrimental effects.

C. The panels shall be watertight.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Submit shop drawings from accurate field dimensions. Shop drawings should clearly show section of panels with all connections, joinery techniques, and provisions for expansion/contraction, precast concrete thickness and profiles. Identify all materials, including metal alloys and fasteners. Locate and identify shop and field sealants on drawings.

C. Samples. Submit full size sample of Glass Block units, which are to be factory installed in precast concrete grid.

D. Product Data: Manufacturer’s data on products to be provided, showing physical properties and installation instructions.

E. Structural Calculations: Submit structural calculations for live and dead loads confirming the panels’ capacity to withstand the specified load requirements. Engineer shall be licensed in the State of Texas.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: The manufacturer of the shop fabricated panels shall be a firm with not less than ten (10) years of successful experience in supplying the same type of panels as required for this project. Factory assemble each panel at the manufacturing facility employing qualified personnel solely engaged in prefabricated panel production.

B. Installer Qualifications: Experienced in installation of specified product and as approved by manufacturer.

C. Design Criteria: The drawings and specifications are based on a specific type of panel by a single manufacturer. Equivalent type panels by another manufacturer may be acceptable only if deviations in dimension, profile, appearance, and performance history are minor and do not materially detract from the design concept or intended performances, as judged solely by the Architect.

1.05 WARRANTY

A. Manufacturer shall warrant the panels to be free from manufacturing defects in either material or workmanship for a period of at least one (1) year from the date of shipment. Defective materials and workmanship includes abnormal deterioration, aging, or weathering of work,

leakage of water, structural failure, deterioration of finishes in excess of normal weathering and aging.

B. The Installer shall furnish a written warranty covering defects in the handling, installation procedures, materials, and workmanship of field applied perimeter sealants work for a period of at least one (1) year from the date of installation. The Installer's liability shall be limited to the prompt repair or replacement of panels, materials, and/or perimeter sealant work.

C. Submit written warranties signed by the manufacturer, installer and contractor, agreeing to repair or replace defective materials and workmanship during the warranty period. Manufacturer must be able to document its warranty based upon at least 50 projects with at least 5 years of successful field performance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer:
   1. Circle Redmont, Inc. 2760 Business Center Blvd., Melbourne, Florida 32940. Telephone: (321) 259-7374 or (800) 358-3888.

2.02 MATERIALS

A. Circle Redmont Glass Paver and Precast Concrete Panels.
   1. Custom size to match existing, as indicated on Drawings.

B. The factory prefabricated panels shall consist of the following:
   1. Panels shall be factory precast and glazed, of overall size as field verified. Concrete materials, reinforcing steel and formwork shall be manufacturer's standard. Concrete mix design, size, and placement of reinforcing shall produce a concrete grid which will meet or exceed the specified structural performance.
   2. Formed surfaces of the concrete grid to have required radius on all inside and outside form surfaces for optimum panel performance and shall have a smooth underside finish. The top surface of the concrete grid, i.e., those surfaces of pedestrian traffic, shall have manufacturer's standard light boom finish.
   3. Solid Glass Pavers units shall be standard, traffic bearing, replaceable type glass. Glass units shall be initially factory installed in respective cell openings using Manufacturer's standard waterproof sealant and bedding material.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate with Manufacturer to ensure handling of panels in a manner that will prevent undue stress on component parts, sealants, and structural members. Do not rack, torque, or cause load forces in an inappropriate manner. Lift panels from top only unless specifically instructed by Manufacturer. Prevent damage to finished surfaces.

B. Store panels in a dry place, off the ground. Bear fully along all supported edges on level and true structural supports.

C. Handle materials to prevent damage to finished surfaces. Do not install components that have been damaged or stained.

3.02 EXAMINATION

A. Verify that areas to receive installation are ready for work in this section.

B. Verify that glass is not cracked, chipped, broken, or damaged.

3.03 PANEL INSTALLATION

A. Install in accordance with Manufacturer's instructions.

B. Coordinate with Manufacturer to ensure that panels are set into prepared openings and shall bear fully along all supported edges on structural supports. Top of panels shall finish flush with

adjoining surfaces unless otherwise shown on Drawings. Where neccessary, build up support ledges and beams as required with materials similar to support members, prior to placement of panels.

C. Panels shall be set to proper pitch and crossfall to ensure proper drainage of surface water and avoid ponding, and connected as indicated on Drawings.

D. Allow 1/2 inch spacing between panels and adjacent surfaces, and between adjoining panels, to permit installation of backer rod and sealant. All joints, that are exposed to the weather and to surface traffic shall be sealed with manufacturers recommended sealant.

3.04 FIELD APPLIED SEALANTS

A. Field applied sealants, per Manufacturer's instructions, for use in location hereinafter specified under Part 3:
   1. One component polyurethane, gun-grade sealant.
   2. Two part pourable polyurethane sealant, traffic bearing.
   3. Backer Rod: Compressible rod stock, bond breaker type, as recommended by sealant manufacturer.

3.05 FIELD TESTING

A. After panel installations are completed they shall be field tested for leakage. Test shall be conducted by flooding the surface of panels with a sprinkler hose for a period of 15 minutes while observations are made of the undersides. Correct any deficiencies which are found in a manner to make panels completely water tight. Conduct testing in the presence of the Architect or the Architect's designated representative.

3.06 CLEANING AND PROTECTION

A. Protect installed panels from damage during continued construction operations. Replace any cracked, broken, or otherwise damaged glazing units prior to date of substantial completion.

B. Maintain installed panels, including glazing, in reasonable clean condition during construction operations. Remove any stains or materials which may have adverse effect on panel materials and finishes. Remove any excess glazing compound and sealants.

C. Clean surfaces and glazing units from any accumulations of dirt, stains, etc. prior to date of substantial completion.

D. Contractor to provide Owner with a copy of the panel manufacturer's complete printed instructions for maintenance and replacement of any damaged glazing units.

END OF SECTION

SECTION 10 8500
KEY STORAGE CABINET

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Key Storage cabinet for fire/police rapid entry

1.02 REFERENCE STANDARDS

A. UL 1037

B. UL 1610 - Standard for Central Station Burglar Alarms Units

C. UL 1332 - Standard for Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment.

D. UL 437 - Standard for Key Locks

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data and manufacturer's standard installation methods and details

C. Shop drawings: Include methods of installation differing from manufacturer's standard details. Indicate dimensions, clearances, and depth of recess.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Knox Box - 1601 W Deer Valley Rd. Phoenix Az 85027 - Tel: 800-552-5669 - Fax: 623-687-2290 - Info@knoxbox.com.

B. Product:
   1. KnoxBox model 3200 Series
   2. Dimensions: Recessed 7"H x 7"W
   3. Capacity: 2
   4. Color: Dark Bronze
   5. Lock: Single Lock - UL Listed. Double-action rotating tumblers and hardened steel pins accessed by a biased cut key.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Set grilles level, plumb, with uniform joints, and in alignment with adjacent work as indicated.

C. Mechanically secure box to supporting structure.

END OF SECTION

SECTION 11 3013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Roof Top Terrace Appliances

1.02 RELATED REQUIREMENTS

A. Section 064100 - Custom Cabinets

B. Section 22 1005 - Plumbing Piping: Plumbing connections for appliances.

C. Section 26 0583 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

C. Gas Appliances: Bearing design certification seal of American Gas Association (AGA).

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warrant all items furnished and installed for a period of one(1) year following date of final unit completion. In the event any appliance is nonfunctional for a period exceeding 24 hours because of an appliance defect during the warranty period, Contractor shall replace unit with a working appliance on a permanent or loan basis.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Refer to drawings for location of appliances.

B. **Cooking Exhaust,**

1. Type: Retractable (Pop-up) Downdraft Vent System
2. Size: 36 inches (91.4 cm) wide.
3. Fan: Centrifugal Blower, 600 cfm, Infinite speed control
4. Exhaust rectangular in wall, vented thru roof.
5. Exterior Finish: Stainless Steel.
6. Manufacturers:
   a. Jenn-Air Brand Home Appliances
      553 Benson Road
      Benton Harbor, MI 49022-2692
      Tel: 1-800-536-6247
   b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOF TOP TERRACE APPLIANCES

A. Refer to drawings for location of appliances.

B. **FIRE PIT**
1. Type: Baltic Square Fire Table
2. Model: T9620NG
3. Size: 36" (91.4 cm) W x 36" (91.4 cm) D x 15.5" (39.37 cm) H.
4. Weight 152 Lbs
5. Masterpack UPC: Glacier Gray 752370962036
6. BTU's: Natural Gas - rated up to 50,000 BTU's of heat.
7. Settings: High & Low
8. Accessories
   a. Natural Gas Table
   b. Lid
   c. 50,000 BTU burner
   d. Small brown lava rock
   e. Electronic Ignition
   f. 10' gas hose
   g. Protective storage cover.
9. Manufacturers:
   a. Real Flame Inc
      7800 Northwestern Avenue
      Racine, Wisconsin 53406
      Tel: 1-800-654-1704
   b. Substitutions: See Section 01 6000 - Product Requirements.

C. **HOSE REEL**
1. Type: Never Leak
2. Model: 2416500
3. Material: Plastic
4. Mounting: Wall Mount.
5. Hose Length 100ft
6. Accessories
   a. Mounting Kit
   b. 100 ft 1/2" Garden Hose
   c. multi function spray nozzle
7. Manufacturers:
   a. Ames products
      Camo Hill, PA
      800-393-1846
   b. Substitutions: See Section 01 6000 - Product Requirements.

D. **PLANTER LINERS**
1. Type: CWS Planter Liners W/ container Irrigation
2. Model: PB1
3. Width: 8"-10"
4. Planting Area: 6"
5. Length: Field Verify
6. Manufacturer:
   a. Tournesol Siteworks
   b. 3930 Faber St.
   c. Union City, CA 94587
   d. Toll: 800-542-2282
   e. Tel: 510-471-6243

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify cabinet openings are present and correctly sized from the millwork shop drawings.

B. Verify utility rough-ins are present and correctly located with the plumber and electrician present.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Connect units to electrical, water, and waste lines in a code compliant manner.

C. Install freestanding equipment level, flush and stable with all features and accessories securely and properly attached.

D. Securely anchor built-in equipment in place, using manufacturer's compatible mounting accessories as applicable.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 12 6210
FURNISHINGS AND UPHOLSTERY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Deck Patio Cushions .

1.02 DESCRIPTION

A. Work of this Section, as shown or specified, shall be provided by the Interior Contractor and shall be in accordance with the requirements of the Contract Documents.

B. Work includes coordination, fabrication, delivery and installation of all furnishings and upholstery items as indicated on the drawings and as specified herein. Interior Contractor shall provide all fabrics, furniture framework, labor and materials unless indicated otherwise.

1.03 REFERENCE STANDARDS

A. Upholstered furniture foam components to meet or exceed ASTM D-3574 Standard Test Method for Flexible Cellular Materials.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Submit the following for each item of Furnishings and Upholstery to Consultant for approval:

C. Shop drawings: Indicate fabrication methods, to include plans and elevations at not less than1/2" = 1'-0" (or 1:20) scale. Sections and details at not less than 3" = 1'-0" (1:5) scale. Indicate compliance with specification requirements.

D. Two samples of each finish and fabric which will be exposed on the completed and installed item. Samples of finishes shall be applied on the appropriate wood or base material as will occur on the final item.

E. One sample of each specially fabricated (ie. custom) item. submit item in sufficient time for approval prior to fabrication; balance of work on such items shall not proceed unless authorized or approved in writing.

F. Where "or equal" is specified, submit sample of item with a proposal for consultants approval.

G. Where any special construction or upholstery methods are specified submit one sample of each for approval.

1.05 QUALITY ASSURANCE

A. All work shall be by experienced skilled workmen to the highest standard of craftsmanship. All materials used shall be new and of the finest quality.

B. All work and materials shall conform to the drawings and specifications; any changes or deviations in materials or methods must be approved by the consultant.

C. All items shall be of contract quality appropriate to the indicated use.

D. All items fabricated, delivered and installed on the project shall match approved samples applicable to that item.

E. All furnishings and upholstery shall meet requirements of local and state codes where applicable. Comply with all laws, ordinances, rules and regulations and orders of any public authority having jurisdiction over this part of the Work.

F. The Contractor shall examine all conditions pertaining to the installation of Furnishing and Upholstery and shall provide all coordination as required to achieve the proper and timely completion of the installation.

G. The Contractor will not change brands of materials during the course of the Work, unless approved by Consultant.

1.06 MOCK-UP

A. Provide mock up of one section of deck furnishing with cushions, illustrating assembly, approved fabric selection, and finish.

B. Mock-up may remain as part of the work once approved.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Special Warranty: Manufacturer’s standard form in which the manufacturer agrees to repair or replace movable furniture that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures, including excessive deflection, that impair furniture’s usefulness.
   2. Faulty operation of hardware.
   3. Deterioration of finishes and other materials beyond normal wear.
   4. Warranty Period: Not less than ten (5) years from Notice of Acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Rudy's Custom Upholstery & Design, Inc - 4334 McCullough Ave, SA, TX 78212 - Tel: 210.821.5156.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. All upholstery fabrics shall be treated with an approved stain/soil Resistant Finish. Such treatment shall be in accordance with all applicable code restrictions and requirements and shall be in accordance with manufacturers' recommendations. Approved stain/soil Resistant Finishes are as follows: a. Fiber-Seal by Fiber-Seal International. b. Scotchgard by 3M. c. Teflon by DuPont.

B. All fabrics as required by law shall be flameproofed. Certificate of Flameproofing shall be provided to the Owner according to Section 01720, Record Documents.

C. Unless indicated otherwise, Contractor shall provide and install all materials, items, and accessories as indicated on drawings and specifications comprising all or part of the Furnishing and Upholstery shown. All items, accessories, and materials shall be installed according to manufacturers' recommendations.

D. Wherever urethane foam cushioning is utilized in seating specified herein, it must be combustion modified high resiliency (ICMR) Foam. Seat cushions in excess of 1-1/2" (40 mm) thickness must have an ILD of 25. Seat cushions of 1-1/2" (40 mm) thickness or less must have an ILD of 35 or greater. The ICMR foam must meet or exceed the standards established by the following agencies: a. City of San Antonio

E. For upholstered items with loose cushions, and unless specified otherwise, attach loose cushions to item with sewn fabric loops through metal rings.

F. All seams shall be double stitched unless specified otherwise.

G. It is the Contractors responsibility to verify all required yardage or meterage based on furnishing configuration, fabric widths, and nap and/or pattern match requirements.

H. All methods of fabric treatment shall be compatible with fabric and shall not affect fabric color, texture, or fabric manufacturer's guarantees.

I. Upon project completion, all excess fabric shall be delivered to Owner for his attic stock and future use. Fabric shall be wrapped in protective covering and tagged identifying fabric with manufacturers' information as well as respective project use information including Consultants specification item number.

J. All fabric canopies shall be easily removable for cleaning. Submit complete description (including drawings as required) of method of attaching and detaching for approval.

K. All exposed wood finishes shall meet or exceed the quality standards and material standards specified in Sections 06410. All exposed woods shall be of the specie indicated on drawings and specifications.

L. All finish materials shall be treated with flame retardant process where required by local code. Should flame-retardant process cause change in color and effect on finish material, Contractor shall notify the Consultant.

M. Interior Contractor shall be required to submit certification from the manufacturers stated herein that the fabrics provided are preshrunk and have a zero percent shrinkage.

N. Material A: Sunbrella Casual Furniture & Umbrella Fabric..
CONTENTS: 100% Solution Dyed Acrylic
WEIGHT: Approximately 8.0 ounces per square yard / 271 grams per square meter.
WIDTH: 54 inches / 137.1 cm
Color: To be selected by Architect from full range.
Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 FABRICATION

A. All work shall be in accordance with the highest applicable industry standards to achieve the intended serviceability, comfort, and aesthetics as indicated on the drawings and specifications.

3.02 INSTALLATION

A. Delivery, installation and setting-in-place shall be by a pre-arranged schedule; this schedule shall not conflict with other trades or create circumstances for merchandise to be damaged. Equipment and furnishings shall be installed only when areas involved are ready to receive them.

B. All items shall be labeled, tagged, or otherwise identified on both the item and any nontransparent protective covering with their respective locations, consultants item number as per specification and/or room numbers. (Example: GF-20 Dresser, Room 642)

C. Unless each item is tagged it will not be accepted at warehouse or job site. Should items not tagged be accepted, the Contractor shall be backcharged the additional labor costs (including overhead) involved in determining the identity and room location of the items involved.

D. Protect installed Furnishings and Upholstery from damage by work of other trades until Owner's acceptance of the work. Subcontractor to advise Contractor of procedures and precautions for protection of materials and installed Furnishings and Upholstery from damage and of any required temperature/humidity conditions which must be maintained during the remainder of the construction period in areas of Furnishings and Upholstery installation.

E. Remove items damaged by failure to provide protection and/or protection information required above (Paragraph 3.2.4) and replace without extra cost to Owner.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
1. Use operation and maintenance data as reference during demonstration.
2. Briefly describe function, operation, and maintenance of each component.

END OF SECTION

SECTION 13 7110
ACCESS CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access Control to Residential units.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

B. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI/TIA/EIA) 568 – Commercial Building Telecommunications Cabling Standard.

B. International Organization for Standards (ISO) 9001:2008 – Quality Management Systems – Requirements.

1.04 PERFORMANCE REQUIREMENTS

A. The contractor shall provide and install all equipment, accessories and materials necessary for a complete operating system in accordance with the following specifications.

B. The equipment furnished under this specification shall be the standard product of one manufacturer and shall be as manufactured by TekTone® Sound & Signal Mfg., Inc.

C. The contractor shall guarantee availability of local service and available stock of the manufacturers' standard parts.

D. The contractor shall be responsible for providing a complete functional system including all necessary components, whether included in this specification or not.

1.05 SYSTEM OPERATION

The apartment entry system shall operate as follows:

A. The visitor, by depressing the appropriate room call button in the entry panel, shall sound a tone to the speaker remote in the apartment.

B. The tenant may answer and converse with the caller by pressing the TALK and LISTEN buttons alternately, which shall be spring type to insure privacy.

C. After acknowledging the visitor, the tenant shall press the DOOR button on the suite station, releasing the entrance door into the building.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: The electrical contractor shall submit shop drawings to the electrical engineer for approval. .
   1. Wiring Diagrams: Indicate wiring for each item of equipment and interconnections between items of equipment.
   2. Include manufacturer's names, model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
   3. The contractor must have approved shop drawings in his possession prior to installation.

1.07 QUALITY ASSURANCE

A. Examine areas to receive integrated security and communication system.

B. Notify Architect of conditions that would adversely affect installation or subsequent use.

C. Do not begin installation until unacceptable conditions are corrected.

1.08 DELIVERY, STORAGE, AND HANDLING

A. A. Delivery: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer’s instructions.

C. C. Handling: Protect materials during handling and installation to prevent damage.

1.09 FIELD CONDITIONS

A. A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 1 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 BASE BID MANUFACTURER

A. TekTone - 324 Industrial Park Road, Franklin NC 28734 - tektone@tektone.net - Tel: 828.524.9967 - www.tektone.com.

1. Products:
   a. Tek-Entry Apartment Entry System - IL525.
   b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 EQUIPMENT

A. **Apartment (2 units)**

The suite station shall be an IR 207B and have:

1. Separate TALK, LISTEN, and DOOR spring-returned buttons.
2. Satin brushed stainless steel faceplate.
3. 3.25" diameter speaker with voice frequency response.
4. Screw terminals for wire termination, clearly labeled.
5. Square head tamper-resistant mounting screws.
6. Flush mount using 2 gang mount ring or box.
7. Recessed mounted.

B. **Entrance Panel - (1 unit)**

The entrance panel shall be AM492/02 (vandal) and have:

1. Extruded aluminum construction.
2. One (1) self-wiping button for each apartment.
3. One (1) replaceable black name holder per button.
4. One (1) 2.5" Mylar speaker.
5. Recessed mounted.

C. **Amplifier**

The system’s amplifier shall be PK543 and shall have

1. Separate controls for audio and call tone volume accessible from the front of the panel.
2. Selectable AC or DC voltage supply for door release.
3. Selectable delayed door timing of 10 or 20 seconds.
4. Selectable steady or warble call tone.

5. Fifteen (15) pin plug-in connector.
6. Shall be UL 813 listed.

D. **Door Strike**
Shall be PO001 for standard duty mortise-type installation operating on 16 VAC.

E. **Transformer**
Shall be SS102A (hard-wired) or SS105B (plug-in), 16 VAC, 10 VA and shall be UL approved.

F. **Wiring**
System wiring shall be four (4) wires consisting of three (3) common conductors and one (1) selective conductor per suite. Wiring shall be in strict accordance with TekTone® IL487 wiring diagram (and IL499 when using the PK502B dual entrance relay).

PART 3 EXECUTION

3.01 PREPARATION

A. 1. All units, except for the entrance station and tenant door station, are designed for indoor use only. Do not use outdoors.

B. The unit turns inoperative during power failure.

C. In areas where broadcasting station antennas are close by, intercom system may be affected by radio frequency interference.

D. Keep the intercom wires at least 1 foot (30 cm) away from strong electrical wiring (AC 100-240 V) including, in particular, wiring for inverter electrical appliances. Noise and malfunction could result.

E. Keep the unit more than 3.3 feet (1 m) away from radio or TV set.

F. If a strong light shines on the main unit screen, the picture will turn white or only silhouettes will be visible.

G. Other manufacturer's devices (such as sensor, detectors, door releases) used with this system, comply with the manufacturer’s installation requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install integrated security and communication system in accordance with manufacturer’s instructions at locations indicated on the Drawings.

C. Mount equipment plumb, level, square, and secure. For video entrance stations and video door stations, comply with manufacturer’s design requirements to provide optimum picture quality of station monitoring

3.03 DEMONSTRATION AND TRAINING

A. Demonstration:
1. Demonstrate that integrated security and communication system functions properly.
2. Perform demonstration at final system inspection by qualified representative of manufacturer.

B. Instruction and Training:
1. Provide instruction and training of Owner’s personnel as required for operation of integrated security and communication system.
2. Provide hands-on demonstration of operation of system components and complete system, including user-level program changes and functions.
3. Provide instruction and training by qualified representative of manufacturer.

3.04 PROTECTION

A. A. Protect installed integrated security and communication system from damage during construction.

END OF SECTION

SECTION 14 2600

LIMITED USE/LIMITED APPLICATION ELEVATOR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Limited Use/Limited Application (LU/LA) Hydraulic Passenger Elevator.

B. The scope of this section of work is the provision and installation of a LU/LA Elevator, all the necessary equipment required to fully complete the installation, and coordinate between the other associated work required by other trades. The equipment specifications are based on the Symmetry Elevating Solutions Elevation LU/LA product design.

1.02 RELATED SECTIONS

A. Section 00330 - Cast -in-Place Concrete: Concrete shaftway, anchor placement and required sleeves for service penetrations.

B. Section 06100 - Rough Carpentry: Blocking in framed construction for lift attachment.

C. Section 05500 - Metal Fabrications: Miscellaneous supports, lintels, etc.

D. Section 07724 - Roof Hatches: Smoke venting hatch at top of hoistway.

E. Section 07100 - Waterproofing: Pit waterproofing.

F. Section 08310 - Access Doors and Panels: Fire rated access doors into hoistway.

G. Section 09260 - Gypsum Board Assemblies: Gypsum shaft walls.

H. Section 09650 - Resilient Flooring: Floor finish in cab.

I. Section 13850 - Detection and Alarm: Fire and smoke detectors and interconnecting devices.

J. Section 15440 - Sump Pumps.

K. Division 16 - Electrical:
   1. Electrical characteristics and wiring connections.
   2. Electrical service to lockable fused disconnect in elevator machine room.
   3. Electrical service for machine room, machine room convenience outlets, machine room lighting and lighting in elevator pit.
   4. Telephone service and wiring connection.

1.03 REFERENCES

A. This elevator shall be designed and tested in accordance with ICC/ANSI 117.1, NEC and ASME A17.1 Guidelines.

B. All designs, clearances, construction, workmanship and installation shall be in accordance with the requirements and code adopted by the authority having jurisdiction.

C. This LU/LA elevator shall be subject to local, city and state approval prior to and following installation.

1.04 REGULATORY REQUIREMENTS

A. Provide passenger elevator in compliance with:
   1. ASME A17.1 - Safety Code for Elevators and Escalators.
   2. ASME A17.5 - Elevator and Escalator Electrical Equipment.
   3. Requirements of Americans with Disabilities Act.

1.05 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Information:
   1. Submit manufacturer’s installation instructions including preparation, and equipment handling requirements.
   2. Show maximum and average power necessity.

C. Shop Drawings:
   1. Show typical details of assembly, erection and anchorage.
   2. Include wiring diagrams for power, control, and signal systems.
   3. Show complete layout and location of equipment, including required clearances and coordination with shaftway.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company shall contain personnel with not less than ten (10) years of experience in the design and fabrication of LU/LA elevators.

B. Technical Services: Manufacturer and authorized dealer shall work with architects, engineers and contractors to adapt the LU/LA elevator to the design and structural requirements of the building, site, and code requirements.

C. Unit shall be tested in the factory before shipment. Elevator equipment shall meet or exceed the National and Local standards.

D. All load ratings and safety factors shall meet or exceed those specified by all governing agencies and be certified by an independent professional engineer.

E. Installer Qualifications: Factory trained and licensed to install equipment of this scope, with evidence of experience with specified equipment. Installing company shall have qualified people available to ensure fulfillment of maintenance and callback service.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Products stored in manufacturer's unopened packaging until ready for installation.

B. Components stored off the ground in a dry covered space, protected from weather conditions.

1.08 PROJECT CONDITIONS

A. LU/LA Elevator not to be used for hoisting materials or personnel during construction.

1.09 WARRANTY

A. Unit shall have a THREE (3) year limited parts warranty covering replacement of defective parts of the basic unit, including all electrical and drive system components, at no cost. Labor costs required to replace parts is not included. Preventative maintenance agreement required.

1.10 MAINTENANCE SERVICE

A. Maintenance of a LU/LA elevator shall consist of regular cleaning, inspection, and adjustment of the unit at intervals not longer than every six (6) months. Rule 10.2.1 of ASME A17.1 requires all LU/LA elevators to be inspected every six (6) months. Provide Maintenance contract for the following years:
   1. 3 years.

B. Maintenance of the LU/LA elevator until shall consist of regular cleaning, inspection, adjustment, lubrication and examination not less than every six (6) months. Repair or replace parts when necessary. Rule 10.2.1 of ASME A17.1 requires all LU/LA elevators to be inspected every six (6) months. Proved emergency call back service for this maintenance period.

C. Maintenance work to be performed by factory trained and licensed technician.

PART 2 PRODUCT

2.01 MANUFACTURER

A. Acceptable Manufacturer: Symmetry Elevating Solutions
   1. Email: customerservice@symmetryelevator.com
   2. Toll Free: 877.568.5804
   3. Website: www.symmetryelevators.com

B. U.S. OWNED AND OPERATED: Manufacturer must be owned in the U.S. and operate in the U.S.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 2500.

2.02 LIMITED USE/LIMITED APPLICATION (LU/LA) ELEVATOR

A. Symmetry Elevating Solutions LU/LA Elevator:
   1. Capacity:
      a. 1400 pounds.
   2. Car Size: Maximum of:
      a. 48 inches by 54 inches.
   3. Platform Configuration:
      a. Straight Through.
   4. Travel:
      a. ___18__ feet __3___inches.
   5. Stops:
      a. 3 stops.
   6. Speed: 30 feet per minute.
   7. Pit Depth:
      a. 13 inches minimum with alternate bottom car clearance device standard Elastomeric Bumpers.
   8. Overhead Clearance:
      a. Total overhead clearance required is 108” (existing construction with alternate top car clearance device), 132” (new construction) above the upper landing level for standard height car.
   9. Power Requirements.
      a. 208/230 VAC, 30 Amp, Single Phase.
   10. Hydraulic Power Unit:
      a. The pump shall utilize a 4 HP high efficency, low power consumption motor.
      b. The pump, submerged motor and valve shall be pre-wired, ready for connection to the controller in the field.
      c. Acceleration, deceleration, and leveling speed controls shall be provided in the UP and Down directions. Full speed adjustment shall be provided in the Down direction only.
      d. Two speed operation shall be provided.
      e. Adjustable pressure relief valves shall be provided.
      f. Manual emergency lowering valve shall be provided.
      g. Pressure gauges and pressure gauge isolation valves shell be provided.
      h. Manual valve isolation between pump unit and jack shall be provided.
      i. Negative pressure switch shall be provided.
      j. Testing: Shall be factory tested prior to shipment.
      k. Muffler shall be provided for vibration & noise damping during elevator operation.
   11. Cylinder:
      a. Construction: Steel pipe with cylinder head having an internal guide ring and self-adjusting, Self-lubricating packing.
      b. Safety Valve: Cylinder shall be equipped with an overspeed safety valve to prevent uncontrolled car descent.
   12. Plunger:
      a. Construction: Shall be machined steel shaft equipped with a stop, electrically welded to bottom end, to prevent plunger from leaving shaft cylinder.
      b. Diameter: 90 mm.
   13. Hoistway Access:
      a. Keyed Hoistway Access
         1) Top Floor.

2) Bottom Floor.

14. Components:
    a. Suspension system: 1:2 system using (2) 3/8" - 7x19 Galvanized aircraft cables integrated with rams header sheave mounted to the plunger.
    b. Guide Rail: Shall consist of two 8 lb. tee rails. Provide brackets to hold rail assembly to walls. Rail shall be furnished with steel splice plates and hardware.
    c. Car Frame: Shall be equipped with non-metallic faced roller guide wheels.
    d. Leveling Device: Provide Hall-effect Sensor based device integrated with tapeless Selector Package to maintain car within ¼" of the landing.
    e. Buffer Springs - No additional pit depth required.
15. Controls:
    a. Selective collective PLC-based controller (Programmable Logic Controller) with Hardware Circuit Monitoring.
    b. "Self Diagnostic System" utilizing diagnostic codes displayed in car to provide information in the event the elevator will not operate. All required redundancies are monitored by the PLC and verified by a hardware monitoring system in compliance with A17.1 2.26.9.3.
    c. Visual & Audible directional indicators passing chime.
    d. All Elevator Electrical Systems shall conform to ASME A17.5.
16. Car Doors
    a. Size 3'0" x 6'8".
    b. Closed Loop Linear 2 speed Door Operator.
    c. Car Door Equipped with a full height safety light screen.
    d. Car Door with electric switch to ensure the car door is closed prior to the operation of the elevator.
17. Hoistway Doors:
    a. Size: Minimum Dimensions 3'0" W x 6'8" H
    b. Type and installation of doors and frames must comply with ASME A17.1, all local codes and manufacturer's layout drawings.
    c. Locking Device: Door shall have a concealed locking device, interlocked with the car operation, to interrupt electrical power when the door is not securely closed and a car is not at the landing zone.
18. Safety Features:
    a. Slack cable protection: Provide an electronically monitored and mechanically actuated hardened steel device that stops and sustains the car in the event of breakage or slackening of cables.
    b. Terminal stopping Device: Shall be provided at the top and bottom of the car travel.
    c. Provide a platform toe guard at the car entrance.
    d. Battery powered emergency operation system:
        1) Powers a light in the car.
        2) Powers an emergency alarm system.
        3) Powers a system to allow car to stop at the next available floor, then run down to the bottom floor stopping at each floor along the way. Door cycles at each landing.
        4) The batteries shall be re-chargeable type complete with an automatic re-charging system.
        5) Emergency operation of Car Lights with half illumination level.
        6) ½" x 2" Flat Handrail #4 SS w/ returned ends.
        7) Overspeed valve.
        8) Final limit switch.
        9) Low oil protection timer circuit.

2.03 CAB DESIGN

A. Cab Design:

1. Interior Walls: Panel selections.
   a. Metal Panel.
2. Interior Walls: Metal Finish.
   a. Custom (Sherwin Williams). SW856 Silver Satin
3. Car Doors:
   a. Custom (Sherwin Williams).SW1611 Graytint
4. Hoistway Door/Frames
   a. Custom (Sherwin Williams).SW1611 Graytint
5. Custom Cab Options:
6. Fire Service Options:
   a. Phase 1 & 2 (FEO-K1 2007).
7. Floor: Prepared ¼" flooring by others.
8. Lighting:
   a. 115 VAC, single phase, 15 Amps.
   b. Failure of one lamp shall not cause the remaining lamps to extinguish.
   c. Lights shall turn on automatically when the elevator door is opened and stay on while the elevator is in use. Lights will automatically turn off after a predetermined time interval when the elevator is not in use.
   d. Overhead low power consumption LED light fixtures.
   e. Color:
      1) Nickel.

B. Call Stations:
1. Control Panel:
   a. One momentary pressure illuminated button for each landing
   b. Keyed in car stop switch and alarm button.
   c. Door open & close buttons.
   d. Hands free ADA phone.
   e. Keyed Calls.
   f. Digital position indicator.
   g. Finish:
      1) Stainless Steel.
2. Hall Call Stations:
   a. One momentary pressure illuminated button for selecting the users desired direction of travel per landing.
   b. Keyed COP
      1) Black.
   c. Keyed Call.
      1) Black.

PART 3 EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Subcontractor Qualifications: A company that is listed as an authorized Symmetry Elevating Solutions dealer. See www.symmetryeleveators.com for details.

B. Electrical devices, service and final connections shall be by a qualified electrician.

3.02 EXAMINATION

A. Do not begin installation until preliminary work including hoistway, landings and machine space has been properly prepared.

B. Verify shaft and machine space are of correct size and within tolerance.

C. Verify required landings and openings are of correct size and within tolerances.

D. Verify hoistway shaft and machine room temperature is designed to have maintainable temperatures between 50 degrees F and 90 degrees F.

E. Verify machine room, when required, is provided with lighting, light switch, convenience outlets and meets the clear space requirements of ASME A17.1 & NEC.

F. Verify hoistway and openings are of correct size and within tolerance.

G. Verify electrical power is available and of correct characteristics.

H. If preliminary work is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.03 ADJUSTING

A. Adjust for smooth acceleration and deceleration.

B. Adjust automatic floor leveling feature at each floor to provide stopping zone of ¼ inch.

C. Adjust door operation.

3.04 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the optimum performance of LU/LA elevator.

3.05 INSTALLATION

A. Unit shall be installed and operated in accordance with the ICC/A117.1, NAEC and ASME A17.1 Guidelines.

B. A dedicated electrical supply provided to the disconnect shall be capable of supplying sufficient power.

C. GC to coordinate “work by others” with elevator contractor.

D. The installation of the LU/LA elevator shall be made in accordance with approved plans and specifications and to the manufacturer’s installation instructions.

E. Startup and test unit in accordance with manufacturer’s instructions.

3.06 FIELD QUALITY CONTROL

A. Perform tests in compliance with ASME A17.1 as required by authorities having jurisdiction.

B. Load the LU/LA elevator to rated capacity and test for several cycles to insure proper operation. No mechanical failures shall occur and no wear that would affect the reliability of the unit shall be detected.

C. Schedule tests with agencies and Architect, Owner, and Contractor present.

3.07 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. Clean unit prior to final inspection.

END OF SECTION

SECTION 22 1116
WATER TAP AND SERVICE LINE INSTALLATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Tapping existing and or new watermains and furnishing and installing new service lines for water.
B. Relocation of existing small water meters.
C. Specifications identify requirements for both small-diameter (less than or equal to 20 inches) watermains and large-diameter (greater than 20 inches) watermains. When specifications for large-diameter watermains differ from those for small- diameter watermains, paragraphs for large-diameter watermains will govern for large-diameter pipe.

1.02 DEFINITIONS

A. Short Side Connection Service Line: Installation of a new corporation main stop and connecting a new length of proposed water service piping between the new proposed watermain to the existing water service piping connected to the existing watermain located on same side of street as to where the new watermain is being constructed.
B. Long Side Connection Service Line: Installation of a new corporation main stop, and connection to the existing water service piping that provides water service to the buildings on the opposite side (long side) of the street from of the centerline of the proposed new watermain.

PART 2 PRODUCTS

2.01 MATERIALS

A. Copper Tubing: Provide Type ‘K’ copper service lines. Where existing service piping is determined to be ‘Copper’ new service piping shall be ‘Copper Tubing’ to match existing.
B. Polyethylene Pipe and Tubing: In accordance with AWWA standards or approved by the SAWS Project Manager.
C. Refer to the enclosed chart for acceptable service line materials.

Acceptable Service Line Materials and Application

Material	3/4"	1"	1.5"	2”	Greater than 2”
Type "K" Copper	X	X	X	X	
HDPE DR 11	X	X	X	X	X
PVC SDR 21			X	X	
PVC C 900/905					X
Ductile Iron					X

D. Corporation Main Stops: AWWA C 800 as modified in this Section:
   1. Inlet End: AWWA standard thread.
   2. Valve Body: Tapered plug type, O-ring seat ball type, or rubber seat ball type.
   3. Outlet End: Flared-copper connection for use with Type K, soft copper or compression type fitting.
E. Provide taps for water line types and sizes in accordance with pipe tapping schedule located in Table 1 at end of this Section.
F. Dual Strap Saddles: Fusion epoxy coated saddles are acceptable as noted.
G. Taps for PVC Watermains: Use dual-strap or single, wide-band strap saddles or Wet Tapping Sleeves which provide full support around circumference of pipe and bearing area of sufficient width along axis of pipe, 2 inches minimum, ensuring that pipe will not be distorted when saddle is tightened. Provide approved stainless-steel tapping saddle with AWWA standard thread.
H. Taps for Steel Pipe: Not allowed, unless specifically approved by Project Manager. Use saddle only when tap is approved on steel pipe.
I. Curb Stops and Brass Fittings: AWWA C 800 as modified in this Section.
   1. Inlet End: Flared copper connection or compression-type fitting
   2. Valve Body: Straight-through or angled, meter-stop design equipped with following:

a. O-ring seal straight plug type.
b. Rubber seat ball type.

3. Outlet End: Female, iron-pipe thread or swivel-nut, meter-spud thread on 3 ¼ - inch and finch stops and 2-hole flange on 1 ½ and 2-inch sizes.
4. Fittings: Provide approved fittings. Use same size open end wrenches and tapping machines as used with respective Mueller fittings.
5. Factory Testing of Brass Fittings:
   a. Submerge in water for 10 seconds at 85 psi with stop in both closed and open positions.
   b. Reject fitting that shows air leakage. SAWS Project Manager may confirm tests locally. Entire lot from which samples were taken will be rejected when random sampling discloses unsatisfactory fittings.

J. Angle Stops: In accordance with AWWA C 800; ground-key, stop type with bronze lockwing head stop cap; inlet and outlet threads conform to application tables of AWWA C 800; and inlets flared connection or compression.
1. Outlet for 3/4-inch and 1-inch size: Meter swivel nut with saddle support.
2. Outlet for 1 ½ -inch through 2-inch size: O-ring sealed meter flange, iron pipe thread.

K. Fittings: In accordance with AWWA C 800 and AWWA C901-02 and following:
1. Castings: Smooth, free from burrs, scales, blisters, sand holes, and defects which would make them unfit for intended use.
2. Nuts: Smooth cast and has symmetrical hexagonal wrench flats.
3. Flare-Joint Fittings: Smooth cast. Machine seating surfaces for metal-to-metal seal to proper taper or curve, free from pits or protrusions.
4. Thread fittings, of all types, shall have N.P.T. or AWWA threads, and protect male threaded ends in shipment by plastic coating, or approved equal.
5. Compression tube fittings shall have Buna-N beveled gasket.
6. Stamp of manufacturer's name or trademark and of fitting size on body.

PART 3 EXECUTION

3.01 GENERAL

A. For service lines and lateral connections larger than those allowed in Pipe Tapping Schedule, A Wet Cut shall be installed, 4” minimum size with an approved Tapping Valve and appurtenances included.

B. Tapped collars of appropriate sizes: Approved in new construction only provided they are set at right angles to proposed meter location.

C. Use tapping machine manufactured for pressure tapping purposes for 2-inch and smaller service taps on pressurized water lines.

D. For new meter or when existing meter is in conflict with proposed pavement improvements, locate water meters one foot inside street right-of-way, or when this is not feasible, one foot on curb side of sidewalk. Contact Project Manager when major landscaping or trees conflict with service line and meter box location. No additional payment will be made for work on customer side of meter.

E. New location and installation of existing small meter shall conform to requirements of this Section.

3.02 SERVICE INSTALLATION

A. Set service taps at right angles to proposed meter location and locate taps in upper pipe segment within 45 degrees of pipe springline.

B. Install service lines in open-cut trench in accordance with SECTION 31 3333 – EXCAVATION, TRENCHING AND BACKFILLING. Install service lines under paved roadways, other paved areas and areas indicated on Drawings in bored hole.

C. Lay service lines with minimum of 30 inches of cover as measured from top of curb or, in absence of curbs, from centerline elevation of crowned streets or roads. Provide minimum of 18 inches of cover below flow line of ditches to service lines.

D. Service lines across existing street (push-unders): Pull service line through prepared hole under paving. Use only full lengths of tubing. Take care not to damage copper tubing when

pulling it through hole. Compression-type union is only permitted when span underneath pavement cannot be accomplished with a full standard length of tubing. Use one compression-type union for each full length of tubing.

E. Maintain service lines free of dirt and foreign matter.

F. Install service lines so that top of meter will be 4 to 6 inches below finished grade.

G. Anticipate existing sanitary sewers to have cement stabilized sand backfill to bottom of pavement. Include cost of such crossings in unit price for services.

3.03 CURB STOP INSTALLATION

A. Set curb stops or angle stops at outer end of service line inside of meter box. Secure opening in curb stop to prevent unwanted material from entering. In close quarters, make S-curve in field. Do not flatten tube. In 3/4-inch and 1 -inch services, install meter coupling, swivel-nut, or curb stop ahead of meter. Install straight meter coupling on outlet end of meter.

3.04 SEQUENCE OF OPERATIONS

A. Open trench for proposed service line in accordance with SECTION 31 3333 – EXCAVATION, TRENCHING AND BACKFILLING.

B. Install curb stop on meter end of service line.

C. With curb stop open and prior to connecting service line to meter in slack position, open corporation stop and flush service line thoroughly. Close curb stop, leaving corporation stop in full-open position.

D. Check service line for apparent leaks. Repair leaks before proceeding.

E. Schedule inspection with SAWS Project Manager prior to backfilling. After inspection, backfill in accordance with SECTION 31 3333 – EXCAVATION, TRENCHING AND BACKFILLING.

F. Install meter box centered over meter with top of lid flush with finished grade.

Table 1
PIPE TAPPING SCHEDULE

WATERMAIN TYPE AND DIAMETER	SERVICE			
	3/4	1	1-1/2”	2”
4” Cast Iron or Ductile Iron	DIRECT	DSS, WBSS	DSS, WBSS	DSS, WBSS
4” Asbestos Cement	WBSS	TS	TS	TS
4” PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	TS
6” and 8” Cast Iron or Ductile Iron	DIRECT	DSS, WBSS	DSS, WBSS	DSS, WBSS
6” and 8” Asbestos Cement	WBSS	TS	TS	TS
6” and 8” Cast Iron or Ductile Iron	DIRECT	DSS, WBSS	DSS, WBSS	DSS, WBSS
6” and 8” PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	TS
12” Cast Iron or Ductile Iron	DIRECT	DSS, WBSS	DSS, WBSS	DSS, WBSS
12” Asbestos Cement	WBSS	TS	TS	TS
12” PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
16” and Up Cast Iron or Ductile Iron	DIRECT	DWBSS	DWBSS	DWBSS
16” and Up Asbestos Cement	DWBSS	TS	TS	TS
16” and Up PVC (AWWA C900)	DWBSS	DWBSS	DWBSS	DWBSS

DSS- DUAL STRAP SADDLES
WBSS - WIDE BAND STRAP SADDLES
DWBSS - DUAL WIDE BAND STRAP SADDLES
TS - TAPPING SLEEVE
DIRECT - DIRECT TAP INTO PIPE WALL

END OF SECTION 22 11 16

SECTION 22 0006

PLUMBING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner cleaned, packaged, and ready for reuse.

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

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

1.3 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
   1. Coordinate with Owner's representative, who will establish special procedures for removal and salvage.

1.4 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services (including but not limited to: Gas, Water, Fire Suppression, Chilled Water, Hot Water, Air Conditioning, etc).
   4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
   5. Means of protection for items to remain and items in path of waste removal from building.

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

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Section “Project Management and Coordination.” Review methods and procedures related to selective demolition including, but not limited to, the following:
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 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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

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

D. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

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

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

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

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

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

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
      a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

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.

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. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
   3. Maintain adequate ventilation when using cutting torches.
   4. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner.

5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. 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.

E. Contractor shall terminate demolished pipe and/or ductwork. System shall be capped and insulated per new work specification.

F. Contractor shall remove any abandoned piping and/or ductwork in area of construction during the demolition process.

G. Unforeseen Conditions
1. Any unforeseen utilities found during construction that directly affect any trade must be brought to the engineer’s attention via RFI.
2. All existing conditions must be clearly annotated on the As-Built drawings.

H. Repair any walls, floors or roofs that piping, ducts or equipment have been removed from (or through). Patch with similar materials to match finish and color (paint to match). If paint cannot be matched, repaint entire wall or surface.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them 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.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 22 0100

SPECIAL CONDITIONS FOR ALL PLUMBING WORK

PART 1- GENERAL

1.1 DESCRIPTION OF WORK

A. This section covers the general provisions of the plumbing specifications applicable to the following systems:
   1. Plumbing.

B. The use of the word plumbing in the body of the various specifications sections shall be interpreted to include all the aspects of all of the systems referenced in the Plumbing Specifications.

1.2 DRAWINGS

A. These specifications are accompanied by drawings of the building and details of the installations showing the locations of equipment, piping, etc. The drawings and these specifications are complementary to each other; requirements described in one or the other shall be considered binding as if described in both.

B. If any departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Owner's Representative for approval. No departures shall be made without prior written approval by the Owner's Representative.

C. There are intricacies of construction which are impractical to specify or indicate in detail; means and methods for performing such work shall adhere to commonly accepted industry standards.

D. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical, Plumbing and Electrical drawings and applicable shop drawings where such information affects his work.

E. For new buildings, all final dimensions shall be scaled from the drawings, unless otherwise noted. For work associated with existing buildings (renovations and additions), all final dimensions shall be field verified.

1.3 CONSTRUCTION REQUIREMENTS

A. The architectural, civil, structural, mechanical, electrical, plumbing, and fire protection drawings, and specifications are all part of the Contract Documents. In many instances there are details described in another trade's drawings that are not necessarily included or referenced in the plumbing drawings. It is the Contractor's responsibility to review in detail all parts of the Contract Documents prior to submitting a bid. Failure to comply with this requirement shall not relieve the Contractor of responsibility or be used as cause for additional compensation because architectural, structural, or electrical details were not included in the plumbing drawings.

B. It is the intent of the Contract Documents to provide complete and fully functional installation in every respect. Material and/or construction details not specifically described in the Contract Documents, but commonly considered incidental to the industry, are required by the Contractor.

C. The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to comply with Codes, to facilitate the work of other trades, to conform to the details of the installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated satisfactory operating installation.

D. The plumbing, electrical and mechanical drawings are schematic in nature and do not show every connection in detail or every pipe or conduit in its exact location. These details are subject to the requirements of ordinances and structural and architectural conditions.

E. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and above suspended ceilings, etc. in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid compromising structural members; therefore, inserts to accommodate hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc. shall be provided as hereinafter specified or as otherwise indicated or required. All work shall be installed parallel or perpendicular to building lines unless otherwise noted.

F. When the plumbing drawings do not give exact details as to the elevation of pipe or equipment, physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Piping and exposed conduit, are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The plans do not show all required offsets, control lines, pilot lines, and other location details. Work shall be concealed in all finished areas. Piping specified to be insulated shall be supported in a manner that will allow the insulation to be installed without gaps. Insulated piping in concealed areas shall be offset with fittings as necessary to permit installation of insulation. Bending of pipes or installing pipes in a strain to insulate will not be permitted.

G. Final placement of serviceable equipment shall be carefully coordinated with all other trades to ensure sufficient clearance for maintenance according to manufacturer’s recommendations. Lubricating orifices and adjustable components shall be easily accessible. Piping, conduit, valve stems, cabling and other building systems shall not interfere with service space.

H. Location of Exposed Devices
   1. All exposed devices (sprinkler heads, medical gas outlets, plumbing rough-ins, lights, outlets, communication devices, etcetera) shall be referenced to fixed data points that are coordinated with all trades; shall be located to present symmetrical arrangements with respect to the fixed data point; and shall facilitate the proper arrangements of acoustical ceiling tiles. Fixed data points shall include such features as wall and ceiling lines, soffits, balanced border widths, masonry joints, etc. Devices located in acoustical ceiling tiles shall occur symmetrically in tile joints or in the centers of whole tiles. The final determination of the exact location of each outlet and the arrangements to be followed shall be acceptable to the Owner’s Representative.
   2. The drawings schematically indicate locations of the exposed devices. Final locations shall be determined by carefully coordinating the drawings pertaining to each trade. Where conflicts are identified, Owner’s Representative shall determine final location. The Owner reserves the right to make any reasonable change in location of any device before installation, without additional cost to the Owner or the Architect.

1.4 QUALIFICATIONS

A. Contractor must have minimum of five years experience installing commercial, plumbing and piping systems similar to those described in these Contract Documents.

B. Contractor must be licensed and hold a current contracting license that has been valid for a minimum of five years in the State of Texas.

C. Contractor must be able to bond work for payment and performance of work being bid. Contractor's bonding agency shall have a Best's insurance rating of A or A+.

1.5 MATERIAL AND EQUIPMENT REQUIREMENTS

A. Manufacturer's Instructions: The manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufacturer materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Owner's Representative in writing of any conflict between the requirements of the Contract Documents and the manufacturer's direction and shall obtain the clarification of the Owner's Representative before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such clarification by the Owner's Representative, he shall bear all costs arising in connection with the correction of the deficiencies.

B. Storage at Site: The Contractor shall not receive material or equipment at the jobsite until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage and from surrounding work.

C. Capacities shall be not less than those indicated and shall be such that no component or system becomes inoperative or is damaged because of startup or other overload conditions.

D. Conformance to Agency Requirements: Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriters Laboratories, Inc., or constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of Underwriters Laboratories, Inc. applied to the item will be acceptable as sufficient evidence that the items conform to such requirements. The ASME stamp or the AMCA label will be acceptable as sufficient evidence that the items conform to the respective requirements.

E. Nameplates: Each major component of equipment shall have the manufacturer's name, address, and model-identification number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Inspection.

F. Prevention of Rust: Standard factory finish will be acceptable on equipment specified by model number; otherwise surfaces of ferrous metal shall be given a rust-inhibiting coating. The treatment shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking and no signs of rust creepage beyond 1/8 inch on either side of the scratch mark. Where rust inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable unless a specific coating is specified, except that coal tar or asphalt-type coatings will not be acceptable unless so stated for a specific item. Where steel is specified to be hot-dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-26915.

G. Protection from Moving Parts: Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.

H. Drive Guards: For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears, and other moving parts regardless of height above the floor. Drive guards may be excluded where motors and drives are inside factory-fabricated air handling units casings. Guards shall be constructed of sheet steel, cast iron,

expanded metal, or wire mesh rigidly secured so as to be removable without disassembling pipe duct or electrical connection to equipment. Provide a 1-inch diameter hole in each drive guard at each shaft center to allow access for speed measurement.

I. Verifications of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Owner's Representative of any discrepancy before performing any work. Adjustments to the work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner, Architect, or Engineer.

J. Standard Products: Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

K. Spare Parts Data: As soon as practicable after approval of materials and equipment and, if possible, not later than four months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies with current unit prices and sources of supply, a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the Contract, and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation. The foregoing shall not relieve the Contractor of any responsibilities under the warranty specified.

1.6 INSPECTION OF THE SITE

A. The Contractor shall visit the site, verifying all existing items indicated on drawings and/or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil conditions, structures, utilities, equipment, systems, facilities, and local requirements. The submission of bids shall be deemed evidence of such visits. All proposals shall take these existing conditions into consideration, and the lack of specific information shall not relieve the Contractor of any responsibility.

1.7 UTILITY LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered separately from the Contract Documents, as a general guide only, without guarantee as to accuracy. Examine the site, the locations, and availability of all utilities and services required for their relation to the work. Verify the location of all existing site utilities with each responsible utility company or applicable party. The Contractor shall repair all damage to existing utilities, whether indicated on the drawings or not, at his sole expense.

1.8 PERMITS, UTILITY CONNECTIONS, AND INSPECTIONS

A. Permitting Fees: Contractor shall pay for all fees associated with permits required by municipal authorities having jurisdiction.

B. Tapping and Impact Fees: Contractor shall pay for all fees associated with tapping into municipal utility mains, including sanitary sewer, natural gas and domestic water. Impact fees will be paid for by the Owner.

C. Compliance: The Contractor shall comply in every respect with all requirements of local authorities having jurisdiction, including building inspections, fire marshal, local ordinances and codes, and utility company requirements. In no case does this relieve the Contractor of the responsibility of complying with these specifications and drawings where specified conditions are of a higher quality than the requirements of the above-specified authorities. Where requirements of the specifications and drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above authorities.

D. Utilities: The Contractor shall coordinate with the various utility companies involved in this project and shall provide required utility relocations, extensions, modifications, and/or changes (complete in all respects) as described in the Contract Documents. Contractor shall verify the location of all existing utilities with the applicable Utility Company. The Contractor shall be responsible for all damages to existing utilities, whether indicated on drawings or not, and repair all damage to existing utilities as acceptable to the affected Utility Company.

E. Certification: Prior to final acceptance, the Contractor shall furnish a certificate of acceptance from the inspection departments having jurisdiction over the work for any and all work installed under this Contract. Any additional labor costs incurred as a result of a substitution shall be the Contractor's responsibility.

1.9 EXISTING FACILITIES

A. The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection, and in-service maintenance of all plumbing, heating, air conditioning, and ventilating services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

B. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being performed under this project.

C. Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc. to provide this access and shall reinstall same upon completion of work in the areas affected.

D. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, all Contractors shall remove and reinstall in locations approved by the Architect/Engineer all devices required for the operation of the various systems installed in the existing construction. This is to include but is not limited to temperature controls system devices, electrical switches, relays, fixtures, piping, conduit, etc.

E. Outages of services as required by the new installation will be permitted but only at a time approved by the Owner. The Contractor shall allow the Owner two weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

1.10 DEMOLITION AND RELOCATION

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination or otherwise disposed of as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor's responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at no additional cost to the Owner.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

1.11 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. No substitution of materials or equipment herein specified or called for on the drawings will be permitted, except by written permission of the Owner's Representative. Where several makes of equipment or material are mentioned, any item named may be bid upon provided it meets space, capacity specifications, and other requirements.

1.12 SUBMITTALS

A. Submittals for Review:
   1. As soon as practical or within 30 days after the date of contract award or notice to proceed, and before purchasing or starting installation of any materials or equipment, the Contractor shall submit for review sufficient material and equipment data to indicate that all requirements of the specifications have been met and samples shall be furnished when requested. All manufacturer's data used as part of the submittal shall have all non-applicable features crossed out or deleted in a manner that will clearly indicate exactly what is to be furnished.
   2. Four (4) copies of the submittal list and detailed submittals (for the Owner's and A/E's use) shall be submitted to the Owner's Representative. The Contractor is requested to include a minimum of three (3) additional copies for insertion in the project's Owner's Manuals at the completion of the project, and the number of additional copies the Contractor requires for his and his subcontractor's use during the project's construction. The detailed submittals shall be accompanied by the same number of sets of pictorial and descriptive

data derived from the manufacturer's catalogs and sales literature, or incorporated in the shop drawings. The Contractor may provide a detailed submittal on any item even though not required by the Owner's Representative.

B. Format
   1. Submittals shall be in pdf format. The first page shall have a cover sheet inserted with the title "PLUMBING SUBMITTALS" centered in large print. Below the title shall be printed the name of the project, the date, the project location, the name and address of the contractor, the name and address of the subcontractor and the name and address of the engineer(s) in smaller print.
   2. Provide a Table of Contents at the beginning of the binder that summarizes the information being submitted according to specification section.
   3. Submittals shall be tab divided by specification section; **all sections** identified in the project specifications shall have a tab. When no information is being provided concerning a particular specification section, insert a single dated sheet that explains the circumstances.
   4. **Loose-leaf or piecemeal submittals are not acceptable and subject to rejection unless prior approval has been granted by the Engineer.**

C. Content:
   1. The Contractor shall prepare or cause to be prepared shop drawings, product data, materials and equipment lists, diagrams, data, samples, and other submittals as required by the contract documents, hereinafter referred to as "Submittal Data." The Contractor shall review and approve all submittal data for compliance with the contract documents, manufacturer's recommendations, adequacy, clearances, code compliance, safety, and coordination with associated work.
   2. The Contractor shall submit approved submittal data to the Owner's Representative for review and comment as to general conformance with the design concept and general compliance with information given in the contract documents. Owner's Representative's review shall not include review of quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with other trades or work, or construction safety and precautions, all of which are the sole responsibility of the Contractor.
   3. The Contractor shall clearly and specifically identify and call to the attention of the Owner's Representative any deviation from the contract documents for which Owner acceptance is desired. The responsibility for such a deviation accepted by the Owner shall remain with the Contractor.
   4. Timeliness: The burden of timeliness in the complete cycle of submittal data is on the Contractor. The Contractor shall allow a minimum of two (2) weeks' time frame for review of each submission by the Owner's Representative. The Contractor is responsible for allowing sufficient time in the construction schedule to cover the aforementioned cycles of data processing, including time for all re-submission cycles on nonconforming materials, equipment, etc. covered by the data submitted. Construction delays and/or lack of timeliness in the above regard are the responsibility of the Contractor and will not justify any request for scheduled construction time extensions or extra compensation.
   5. Work performed in accordance with approved submittal date that is not in accordance with the Contract Documents and did not have the specific acceptance of the Owner's Representative shall be replaced at Contractor's cost.

D. Re-submittals
   1. Re-submit entire submittal in accordance with afore mentioned format and content requirements. **Loose-leaf or piecemeal re-submittals are not acceptable.** New and/or revised data for each section shall be prefaced with a colored (yellow, pink, orange, etc) cover sheet that identifies (in a word or two) the materials and/or equipment being re-submitted. Typeset the words "REVISED SUBMITTAL NO. 1 (or 2, 3 as applicable)" centered at the bottom of the cover sheet.
   2. Subsequent re-submittals (second and third, if necessary) shall have different colored cover sheets to distinguish between the various re-submittals.

3. Include a cover letter at front of binder that specifically responds to each "REVISE AND RE-SUBMIT COMMENT" or "REJECTED" comment by number. Example responses would include the following:
   a. RESPONSE: "Please see attached re-submittal."
   b. RESPONSE: "Will be re-submitted at a later date."
   c. RESPONSE: "Requirement for (xxxxxx) was deleted in Addendum No. 2."
   d. RESPONSE: "Exception requested based on Section xx, Paragraph x.x.x.

E. These paragraphs related to Plumbing submittal data supersede any conflicting requirements contained in Division 01 sections.

1.13 CONTRACTOR CERTIFICATION OF SUBMITTAL DATA

A. The Contractor shall provide the following notarized certificate with all submittal data furnished to the Owner's Representative for review and comment.

Project Title:

Description of Submittal Data:

This is to certify that the above-described submittal data has been reviewed and is approved for compliance with the Contract Documents, manufacturer's recommendation, adequacy, clearances, code compliance, safety, and coordination with other trades and/or work except as follows: (list "none" or itemize and explain). In addition, the Contractor shall submit to the Owner's Representative a signed statement from each representative certifying as follows:

"I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations and are asbestos free."

_____
Name and Company

Notary

1.14 ACCEPTANCE OF MATERIALS AND EQUIPMENT

A. All equipment installed on this project shall have **local (within 125 miles)** representation, local factory-authorized service, and a local stock of repair parts. This requirement is essential and will be strictly reviewed by the Owner's Representative prior to concurrence with the Contractor's approval for all submittals covered by Plumbing Division of this Specification.

B. NOTICE: The Contractor is responsible for providing materials and equipment that conform to the requirements of the project manual in every respect unless a deviation has been "accepted" in writing. Removal of any nonconforming materials and equipment and the replacement with conforming materials and equipment shall be at the Contractor's sole expense, regardless of when nonconformance was discovered.

C. Approval of materials and equipment shall be based on manufacturer's published data and shall be tentatively subject to the submission of complete shop drawings which comply with the contract documents. Approval is also dependent upon the existence of adequate and acceptable clearances for entry, servicing, and maintenance.

D. Approval of materials and equipment under this provision shall not be construed as authorizing any deviations from the specifications, unless the attention of the Owner's Representative has been directed in writing to the specific deviations. Data submitted shall not contain unrelated information unless all pertinent information is properly identified.

E. Physical Size of Equipment: Space is critical; therefore, equipment of larger sizes than shown, even though of approved manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operation, and maintenance.

1.15 SITE OBSERVATION

A. Site observation by the Architect, Engineer, and/or Owner's Representative is for the express purpose of verifying compliance by the Contractor with the contract documents, and shall not be construed as construction supervision nor indication of approval of the manner or location in which the work is being performed as being a safe practice or place.

1.16 SUPERVISION

A. In addition to the Superintendent required under the conditions of the contract, each subcontractor shall keep a competent superintendent or foreman on the job at all times.

B. It shall be the responsibility of each superintendent to study all plans and familiarize himself with the work to be done by other trades. He shall coordinate his work with other trades and, before material is fabricated or installed, make sure that his work will not cause an interference with another trade. Where interferences are encountered, they shall be resolved at the jobsite by the superintendents involved. Where interferences cannot be resolved without major changes to the plans, the matter shall be referred to the Owner's Representative for comments.

1.17 OPERATION PRIOR TO COMPLETION

A. When any piece of equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so, providing that he properly supervises the operation and has the written permission of the Owner's Representative to do so. The warranty period shall not commence, however, until such time as the equipment is operated for the beneficial use of the Owner or date of substantial completion, whichever occurs first.

B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of acceptance and the start of the warranty may not be the same date.

1.18 MANUFACTURER'S RECOMMENDATIONS

A. The manufacturer's published directions shall be followed in the delivery, storage, protection, installation, piping, and wiring of all equipment and material. The Contractor shall promptly notify the Owner's Representative, in writing, of any conflict between the requirements of the contract documents and the manufacturer's directions, and shall obtain the Owner's Representative's comments before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or applicable comments from the Owner's Representative, he shall bear all costs arising in connection with the correction of such deficiencies.

1.19 CHECKING AND TESTING MATERIALS AND/OR EQUIPMENT

A. Before final acceptance of the work, an authorized representative of the manufacturer of the installed materials and/or equipment shall personally inspect the installation and operation of his materials and/or equipment to determine that it is properly installed and in proper operating order. Testing and checking shall be accomplished during the course of the work where required by work being concealed, and at the completion of the work otherwise. In addition, the Contractor shall submit to the Owner's Representative a signed statement from each representative certifying as follows:

"I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations and are asbestos free."

B. Check inspections shall include plumbing, heating, air conditioning, ventilating, mechanical control and electrical equipment, and such other items hereinafter specified or specifically designated by the Owner's Representative.

1.20 OPERATING AND MAINTENANCE INSTRUCTION

A. The Contractor shall prepare for the owner's manual hereinafter specified complete sets of operating and maintenance instructions, system piping, valving, control and interlock diagrams, manuals, parts lists, etc. for each item of equipment. These are to be assembled as hereinafter specified for owner's manual.

B. In addition, the Contractor shall provide the service of a competent engineer or a technician acceptable to the Owner's Representative to instruct a representative of the Owner in the complete and detailed operation of all equipment and systems. These instructions shall be provided for a period of sufficient duration to fully accomplish the desired results. Upon completion of these instructions, a letter of release will be required, acknowledged by the Owner, stating the dates of instruction and personnel to whom instructions were given.

C. Additional diagrams, operating instructions, etc. shall be provided as specified hereinafter in the other sections of these specifications.

1.21 MATERIAL AND EQUIPMENT SCHEDULES

A. Contractor shall refer to both drawings and specification for schedules. Where reference is made to items "scheduled on drawings" or "scheduled in specifications," same shall include schedules contained in both the drawings and the specifications. The Contractor's attention is directed to the various specification sections and drawings for schedules.

1.22 APPLICABLE CODES AND STANDARDS

A. The installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of these specifications, except as may be hereinafter specifically modified in these specifications and associated drawings.
   1. National Fire Protection Association Standards (NFPA):
      NFPA 10 - Portable Fire Extinguishers
      NFPA 54 - National Fuel and Gas Code
      NFPA 70 - National Electrical Code
      NFPA 90A - Air Conditioning Systems
      NFPA 101 - Life Safety Code
      NFPA 255 - Method of Test of Surface Burning Characteristics of Building Materials
      Local and State Health Code (TDSH)
   2. American National Standards Institute (ANSI):

15-78 - Safety Code for Mechanical Refrigeration
C.2 - 1984 National Electrical Safety Code
A117.1 - Handicapped Code

3. American Society of Mechanical Engineers (ASME): Section IV, V, CSD-1
4. Air Conditioning and Refrigeration Institute Standards (ARI): All standards related to refrigeration and air conditioning equipment and piping furnished under these specifications.
5. American Water Works Association (AWWA): All applicable manuals and standards.
6. Sheet Metal and Air Conditioning Contractors National Associate, Inc, (SMACNA): All applicable manuals and standards.
7. Air Moving and Conditioning Association (AMCA): All applicable manuals and standards.
8. American Society of Testing Materials (ASTM): All applicable manuals and standards.
9. National Electrical Manufacturers' Association (NEMA): All applicable manuals and standards.
10. Occupational Safety and Health ACT (OSHA):
National Sanitation Foundation - Standard No. 2
11. American Society of Heating, Refrigeration, and Air conditioning Engineers (ASHRAE):
90-80 Energy Conservation in New Building Design
2001 ASHRAE Handbook of Fundamentals
12. Americans with Disabilities Act, 1990
13. American Gas Association (AGA)
14. Underwriters Laboratories, Inc. (UL)
15. Manufacturer's Standardization Society of the Valve and Fitting Industry (MSS)
16. Applicable State Building Codes (International Building Codes, as amended):
17. Applicable State Mechanical Code (International Mechanical Code, as amended).
18. Applicable State Plumbing Code (International Plumbing Code, as amended).
19. Applicable State Energy Code (International Energy Conservation Code, as amended).

B. All materials and workmanship shall comply with all applicable city, state, and national codes, specifications, and industry standards. All materials shall be listed by the Underwriters Laboratories, Inc. as conforming to its standards and so labeled in every case where such a standard has been established for the particular type of material in question.

C. The contract documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately notify the Owner's Representative in writing of said discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by Division 1 of these contract documents, providing no work or fabrication of materials has been accomplished in a manner of noncompliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules, and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations.

1.23 DEFINITIONS

A. Refer to the condition of the contract for Division 1 for additional requirements regarding definitions.

B. Where "as required" or "as necessary" is used in these specifications or on the drawings, it shall mean "that situations exist that are not necessarily described in detail or indicated that may cause the Contractor certain complications in performing the work described or indicated. These complications entail the normal coordination activities expected of the Contractor where multiple trades are involved and new or existing construction causes deviations to otherwise simplistic

approaches to the work to be performed. The term shall not be interpreted to permit an option on the part of the Contractor to achieve the end result."

C. Where "and/or" is used in these specifications or on the drawings, it shall mean "that situations exist where either one or both conditions occur or are required and shall not be interpreted to permit an option on the part of the Contractor.

1.24 FINAL INSPECTION

A. Refer to Division 1 for additional requirements for final inspection.

B. It shall be the responsibility of the Contractor to personally conduct a careful inspection, assuring himself that the work on the project is ready for final acceptance and developing his own "punchlists," before calling upon the Owner's Representative to make a final inspection. Failure of the Contractor to conduct such inspections and provide the Owner's Representative with a copy of his "punchlists" prior to the final inspection shall be adequate cause for the Owner's Representative to cancel any Contractor-requested final inspection.

C. In order not to delay final acceptance of the work, the Contractor shall conduct his own "final inspections" prior to requesting the Owner's Representative to "final" the project; will have all necessary bonds, guarantees, receipts, affidavits, etc. called for in the various articles of this specification prepared and signed in advance; and together with a letter of transmittal listing each paper included, shall deliver the same to the Owner's Representative at or before the time of said final inspection. The Contractor is cautioned to check over each bond, receipt, etc. before preparing same for submission to see that the terms check with the requirements of the specifications.

D. The final inspection will be made jointly by the Owner's Representative and the Owner.

1.25 REQUIREMENTS FOR FINAL ACCEPTANCE

A. Requirements for final acceptance shall include but not be limited to the Contractor accomplishing the following:
   1. Construction: Complete all construction.
   2. Deficiency Lists: Correct all deficiencies listed at time of Substantial Completion.
      a. Owner's Manual: Submit at least 30 days prior to final acceptance on (1) copy of the owner's manual for the Owner's Representative's review and comments. Following acceptance, prepare three (3) copies of bound and indexed owner's manual, to be delivered System operating instructions.
      b. System control drawings.
      c. System interlock drawings.
      d. System maintenance instructions.
      e. Manufacturers', suppliers', and subcontractors' names, addresses, and telephone numbers, both local representatives and manufacturers' service headquarters.
      f. Equipment operating and maintenance instructions and parts lists.
      g. Manufacturer's' certifications (see Checking and Testing Materials and/or Equipment, this section).
      h. Contractor's warranty.
      i. Acceptance certificates of authorities having jurisdiction.
      j. Log of all tests made during course of work.
      k. Owner's acknowledgment of receipt of instruction, enumerating items in owner's manual.
      l. List of manufacturers' guarantees executed by the Contractor.
      m. Certified performance curves.
      n. Balance and performance test reports.

o. Owner's acknowledgment of items of equipment or accessories indicated or specified to be turned over to Owner.
p. Verbal, as herein specified.
q. Posted, framed under glass or plastic laminated:

3. At the time of final acceptance, which shall include but not be limited to the following:
4. Instructions:
   a. System operating instructions.
   b. System control drawings.
   c. System interlock drawings.
5. Record Drawings: Deliver the specified record drawings to the Owner's Representative.

1.26 RECORD DRAWINGS

A. The Contractor shall maintain a set of contract drawings (black-line prints) at the jobsite on which he shall indicate the installed (as-built) locations of the following:
   1. Equipment
   2. Main lines of piping and ductwork.
   3. Dimensional locations (including depth) of all underground piping, valves and conduits.

B. Drawings shall be used for construction reference and shall not leave the field office of the jobsite.

C. Drawings shall include all addenda, ASI's, Change Orders, and existing conditions and equipment that are not reflected in the original contract drawings.

D. Upon completion of work, the Contractor shall obtain CAD files of the contract drawings from the Owner's Representative and transfer the above as-built information into these files. The as-built files shall be permanently marked "RECORD DRAWINGS" and printed on full-size Mylar sheets. Upon completion, the CAD files shall be transferred to CD in AutoCAD 2007 format. Both the CAD files CD and Mylar drawings shall be submitted to the Owner's Representative as part of the Close-out Submittals.

E. Refer to Division 1 paragraph entitled "Record Documents" for additional requirements.

1.27 ALLOWANCES

A. Refer to Division 1 for allowances.

1.28 ALTERNATE PROPOSALS

A. Alternate proposals are summarized in Division 1 and on the bid proposal form. Refer to all sections of the specifications and the drawings to determine the exact extent and scope of the various alternate proposals as each pertains to the work of the various trades.

1.29 WARRANTY

A. General: All work performed (including equipment and materials furnished) under the various sections of these specifications shall be 100% warranted, for a period of one (1) year from the date of final acceptance thereof, against defective materials, design, and unauthorized substitution. Upon receipt of note of failure of any part of the guaranteed equipment and/or facilities during the guaranty period, the affected part(s) or facilities shall be replaced promptly with new parts, etc. by and at the expense of the Contractor. Further, the Contractor shall properly obtain, execute, and forward any and all manufacturer's warranties on equipment furnished under the Contract. Refer to Division 1 for additional requirements.

B. Extended Period: The Contractor shall provide all extended time warranties available from the manufacturer of the equipment provided as standard at no additional cost. This includes all extended warranties where specified with certain equipment as directed in other sections of this Specification.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.

B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.

C. The responsibility for the furnishing and installation of the proper plumbing equipment and/or material as intended rests entirely upon the Contractor. The Contractor shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

2.2 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS

A. Duct coverings, duct linings, vapor barrier facings, tapes, adhesives, core materials, insulation, jackets, piping (of any sort), and other materials in concealed locations, including any above-ceiling area, shall have a flame spread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating no higher than 50. Flame spread and smoke developed ratings shall be in accordance with NFPA Standard No. 255.

2.3 BEARINGS

A. All ball bearings shall be of radial and/or thrust type, and enclosed in a dust and moisture-proof housing.

2.4 MOTORS

A. The Contractor shall provide all motors required for equipment supplied under each portion of the work. Motors shall be built in accordance with the latest ANSI, IEE, and NEMA standards, shall be fully coordinated with the equipment served, shall be of sizes and electrical characteristics scheduled.

2.5 STARTING EQUIPMENT

A. Each motor shall be provided with proper starting equipment. This equipment, unless hereinafter specified or scheduled to the contrary, shall be provided by the trade furnishing the motor. All motor starting equipment provided by any one trade shall be of the same manufacture unless such starting equipment is an integral part of the equipment on which the motor is mounted.

2.6 FIRE AND SMOKE PARTITION, WALL, AND/OR FLOOR PENETRATIONS

A. Pipe, ductwork, conduit, etc. shall pass through fire- or smoke-rated floors, partitions, walls, or other barriers within a UL-listed assembly which shall maintain the rating of the applicable wall, floor, partition, or barrier.

B. The Contractor shall review the architectural and structural drawings and determine the location of the fire-rated building elements. Where these elements are penetrated, UL-listed fire-rated penetration assemblies approved by the local authority shall be provided in accordance with the manufacturer's instructions to obtain the required rating.

2.7 FOUNDATIONS / HOUSEKEEPING PADS

A. General: All special foundations and supports required for the proper installation of equipment and pipe shall be provided as hereinafter specified and under the section of the specifications covering the equipment, unless otherwise indicated on the drawings.

B. All equipment shall receive concrete housekeeping pads unless otherwise noted. Equipment to be receive pads are to include (but not limited to): boilers, water heaters, water softeners, expansion / compression tanks, filter feeders, water treatment equipment, air compressors, pumps (in addition to inertia bases where required), surge tanks, deareators, etc.

C. Concrete foundations for the support of equipment such as floor-mounted pumps, equipment, etc. shall be not less than 3 inches high and not less than 4 inches larger (in both directions) than supported unit, unless otherwise noted and shall be poured in forms built of new dressed lumber. All corners of the foundations shall be neatly chaffered by means of sheet metal or triangular wood strips nailed to the form. Pads shall not be laid out directly against walls or structures. 2 inches shall be left available for pad form work. Foundation bolts shall be placed in the forms when the concrete is poured, the bolts being correctly located by means of templates. Allow 1 inch below the equipment bases for alignment and grouting (where applicable). Foundations for equipment located on the exterior of the building shall be provided as indicated. Foundations shall be constructed in accordance with approved shop drawings and shall be reinforced with #4 bars at 12 inches on center both ways (minimum).

D. Pipe and Conduit Support: All pipes and conduits throughout the building, both horizontal and vertical, shall be adequately supported from the construction to line of grade, with proper provision for expansion, contraction, vibration elimination, and anchorage. Vertical pipes and conduits shall be supported from floor lines with riser clamps sized to fit the lines and to adequately support their weight. At the bases of lines, where required for proper support, provide anchor base fittings or other approved supports.

PART 3 - EXECUTION

3.1 SPACE AND EQUIPMENT ARRANGEMENT

A. The size of equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers will be acceptable, it is the responsibility of the Contractor to determine whether the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared when required by the Owner's Representative to indicate a suitable arrangement.

B. All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.

3.2 LARGE APPARATUS

A. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

3.3 PROTECTION

A. The Contractor shall take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the uncompleted building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.

B. The Contractor shall protect existing facilities, the work of others, and the premises from any and all damages that may be made possible by the execution of work.

C. Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these specifications.

3.4 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

A. Each trade, subcontractor, and/or Contractor must work in harmony with the various trades, subcontractors, and/or Contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or Contractor must pursue its work promptly and carefully so as not to delay the general progress of the job. This Contractor shall work in harmony with Contractors working under other contracts on the premises.

B. It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the jobsite in a clean and safe condition. At the end of each day's work, each trade shall properly store all of its tools, equipment, and materials and shall clean its debris from the job. Upon the completion of the job, each trade shall immediately remove all of its tools, equipment, any surplus materials, and all debris caused by its portion of the work.

3.5 PRECEDENCE OF MATERIALS AND COORINATION OF WORK

A. These specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the several available spaces, and which will ensure complete and satisfactory systems. Each subcontractor and/or trade shall be responsible for the proper fitting of his material and apparatus into the building.

B. The work of the various trades shall be performed in the most direct and workmanlike manner without hindering or handicapping the work of other trades. Piping interferences shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Where space requirements conflict, the following order or precedence shall, in general, be observed:
1. Building lines.
2. Structural members.
3. Light fixtures.
4. Soil and drain piping.
5. Condensate drains.
6. Vent piping.

7. Supply, return, and outside air ductwork.
8. Exhaust ductwork.
9. HVAC water and steam piping.
10. Steam condensate piping.
11. Fire protection piping.
12. Natural gas piping.
13. Domestic water (cold and hot).
14. Refrigerant piping.
15. Electrical conduit.

C. Coordinate all major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Coordinate space requirements for installation and access. Verify the following:
1. Clearance for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
2. Equipment and accessory service connections and support details.
3. Fire-rated wall and floor penetrations.
4. Scheduling, sequencing, movement and positioning of large equipment into building during construction.
5. Access panel and door locations.
6. Clearances between building openings and VTR's/Flues.

D. The light fixture grid layout as indicated on the drawings must be maintained. This Contractor shall refer to all light fixture plans and details indicated on the drawings and shall coordinate the location of dampers, supply grilles, return air grilles, sprinkler heads, etc. with the location of the light fixtures to assure proper access to all items in a manner acceptable to the Owner's Representative.

E. The electrical trades shall locate all junction boxes, pull boxes, conduits, etc. to avoid interference with the diffusers, dampers, grilles, etc. hereinbefore mentioned. The mechanical trades shall furnish to all other trades copies of approved ductwork shop drawings to assist in the coordination of the rough-in and installation of all items of work.

3.6 CONNECTIONS FOR OTHERS

A. This Contractor shall rough-in for and make all water, sewer, electrical, etc. connections to all fixtures, equipment, machinery, etc. provided by others in accordance with detailed roughing-in drawings provided by the equipment suppliers, by actual measurements of the equipment connections, or as detailed.

B. After the equipment is set in place, this Contractor shall make all final connections and shall provide all required pipe, fittings, valves, traps, connectors, etc.

C. Provide all air gap fittings required, using materials hereinbefore specified. In each water line serving an item of equipment or piece of machinery, provide a shutoff valve. On each drain without integral trap provide a suitable trap.

D. All pipe fittings, valves, traps, etc. exposed in finished areas and connected to chrome-plated lines provided by others shall be chrome-plated to match.

E. Provide all transition pieces, etc. required for a complete installation of equipment provided by others.

3.7 INSTALLATION METHODS

A. Where to Conceal: All pipes and conduits shall be concealed in pipe chases, walls, furred spaces, below suspended floors, or above the ceilings of the building unless otherwise indicated.

B. Where to Expose: In mechanical rooms, janitor's' closets tight against pan soffits in exposed Tee structures, or storage spaces, but only where necessary, piping and conduit may be run exposed. All exposed piping and conduit shall be run in the neatest, most inconspicuous manner, and parallel or perpendicular to the building lines.

C. Support: All piping and conduit shall be adequately and properly supported from the building structure by means of hanger rods or clamps to walls as herein specified.

D. Maintaining Clearance: Where limited space is available above the ceilings and below concrete beams or other deep projections, pipe and conduit shall be sleeved through the projection where it crosses, rather than hung below them, in a manner to provide maximum above-floor clearance. Sleeves shall be as herein specified. Approval shall be obtained from the Owner's Representative for each penetration.

E. All pipe, conduits, etc. shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes, and conduits run exposed in machinery and equipment rooms shall be installed parallel to the building lines, except that they shall be sloped to obtain the proper pitch. Piping and ducts run in furred ceilings, etc. shall be similarly installed, except as otherwise shown. Conduits in furred ceilings and in other concealed spaces may be run at angles to the construction but shall be neatly grouped and racked indicating good workmanship. All conduit and pipe openings shall be kept closed until the systems are closed with final connections.

F. Special Requirements:
1. There shall be no pipe joints nearer than 12 inches to a wall, ceiling, or floor penetration unless pipe joint is a welded or mechanically-coupled-type joint.
2. The Contractor shall study all construction documents and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of the extremely limited spaces. Where conflicts occur the Contractor shall meet with all involved trades and the Owner's Representative and resolve the conflict prior to erection of any work in the area involved.
3. Prior to the installation of any ceiling material, gypsum, plaster, or acoustical board, the Contractor shall notify the Owner's Representative so that arrangements can be made for an inspection of the above-ceiling area about to be "sealed off." The Contractor shall give as much advance notice as possible up to ten (10) working days, but in no case less than five (5) working days.
4. The purpose of this inspection is to verify the completeness and quality of the installation of the air conditioning systems, the plumbing systems, and any other special above-ceiling systems such as pneumatic tube. The ceiling supports (tee bar or lath) should be in place so that access panel and light fixture locations are identifiable and so that clearances and access provisions may be evaluated.
5. No ceiling material shall be installed until the deficiencies listed from this inspection have been corrected to the satisfaction of the Owner's Representative.

3.8 CUTTING AND PATCHING

A. General: Cut and patch walls, floors, etc. resulting from work in existing construction or where made necessary by failure to provide proper openings or recesses in new construction.

B. Methods of Cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Owner's Representative. Impact-type equipment will not be used except where specifically acceptable to the Owner's Representative. Openings in concrete for pipes, conduits, outlet boxes, etc. shall be core drilled

to exact size. **Determine location of embedded conduit and reinforcing bars prior to cutting.**

C. Restoration: All openings shall be restored to “as-new” condition under the appropriate specification section for the materials involved, and shall match remaining surrounding materials and/or finishes.

D. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc. shall be of the proper size and shape, and shall be installed in a manner acceptable to the Owner’s Representative.

E. Plaster: All plumbing work in area containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.

F. Weakening: No cutting, boring, or excavating which will weaken the structure shall be undertaken.

3.9 ROOF PENETRATIONS AND FLASHING

A. Pipe and conduit ducts, pitch pockets, curb bases, and flashing compatible with the roofing installation shall be provided for roof penetrations. Provide framing or other support around all openings through roof as required to preserve the structural integrity of the roof system and make the penetration weathertight.

3.10 EXCAVATING AND BACKFILLING

A. Perform trenching, excavating, backfilling for plumbing work as set forth below.

B. Depth of excavation varies with invert of pipe. Excavation to be carried to a depth of at least 6 inches below bottom of pipe elevation. Fill below pipe (6 inches), around pipe, and a minimum of 12 inches above pipe with sand of Class “B” crushed stone tamped firm and even. Separate topsoil during excavation. Final layer of dirt for exterior installations to be (6 inches minimum) to be topsoil. Backfilling shall be done to exclude use of rock or stone above sand or Class “B” crushed stone.

3.11 TESTS AND INSPECTIONS

A. General: The Contractor shall make all tests deemed necessary by the inspection departments of the engineer and the authority having jurisdiction, Board of Underwriters, etc. He shall provide all equipment, materials, and labor for making such tests. Fuel and electrical energy for system operational tests following beneficial occupancy by the Owner will be paid for by the Owner.

B. Other: Additional tests specified hereinafter under the various specifications sections shall be made.

C. Notification: The Owner’s Representative shall be notified at his office 36 hours prior to each test and other specifications requirements requiring action on the part of the Owner, Architect, Engineer, and/or Owner’s Representative.

D. Test Logs: All tests which the Contractor conducts shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel, description and extent of system tested, test conditions, test results, specified results, and any other pertinent data.

Data shall be delivered to the Owner's Representative as specified under "Requirements for Final Acceptance.

E. Inspections: In general, an inspection by the Owner's Representative shall be required prior to closing up any work and prior to beneficial occupancy or final project completion. The closing up of work includes, but is not limited to, pipe and conduit installations prior to backfilling; mechanical, plumbing electrical, and fire protection work prior to placement of concrete; or closing up walls and overhead mechanical, plumbing, electrical and fire protection work prior to installation of the ceiling.

3.12 CLEANING AND PAINTING

A. Thoroughly clean and touch up the finish on all parts of the materials and equipment. Exposed parts in equipment rooms, and all other spaces except sealed chases and attics shall be thoroughly cleaned of cement, plaster, and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

B. All other painting shall be accomplished under the Painting Section of Division 9 of the specifications.

3.13 DISCHARGE OF WASTES FROM CONSTRUCTION SITE

A. The Contractor shall comply with all applicable provisions of local, state, and federal laws regarding the discharge of wastes into sewer and waterways. Special caution shall be exercised to prevent the discharge of wastes which contain oil, tar, asphalt, roofing compound, kerosene, gasoline, paint, mud, cement, lime, or other materials which would degrade the water quality of the receiving water course. The Contractor shall construct and maintain oil interceptors, settling basins, acid neutralization tanks, and/or other effective pollution countermeasures, as required by the Texas Water Quality Board.

B. On LEED and CHPS projects, contractor is responsible for tracking waste leaving the jobsite. All waste on these projects to be sorted and processed during construction.

END OF SECTION

SECTION 22 0500

BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following basic plumbing materials and methods to complement other Plumbing Sections.
   1. Piping materials and installation instructions common to most piping systems.
   2. Concrete base construction requirements.
   3. Escutcheons.
   4. Dielectric fittings.
   5. Dielectric isolation tape
   6. Flexible connectors.
   7. Mechanical sleeve seals.
   8. Nonshrink grout for equipment installations.
   9. Field-fabricated metal and wood equipment supports.
   10. Installation requirements common to equipment specification sections.
   11. Mechanical demolition.
   12. Cutting and patching.
   13. Touchup painting and finishing.
   14. Access Doors

B. Pipe and pipe fitting materials are specified in Plumbing piping system Sections, if applicable.

1.2 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.

1.3 SUBMITTALS

A. Product Data: For dielectric fittings, flexible connectors, access doors, solder/brazing material and mechanical sleeve seals.

B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

C. Coordination Drawings: Detail major elements, components, and systems of plumbing 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. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
2. Equipment and accessory service connections and support details.
3. Fire-rated wall and floor penetrations.
4. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
5. Access panel and door locations

1.4 QUALITY ASSURANCE

A. All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.

B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

D. 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.

1.5 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.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate plumbing 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 plumbing 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 plumbing materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of plumbing 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 plumbing items requiring access are concealed behind finished surfaces.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Dielectric Tape:
      a. Holdrite (#272-4).
   2. Metal, Flexible Connectors:
      a. Flexicraft Industries.
      b. Flex-Weld, Inc.
      c. Grinnell Corp.; Grinnell Supply Sales Co.
      d. Mercer Rubber Co.
      e. Metraflex Co.
      f. Uniflex, Inc.
   3. Rubber, Flexible Connectors:
      a. General Rubber Corp.
      b. Mercer Rubber Co.
      c. Metraflex Co.
      d. Red Valve Co., Inc.
      e. Uniflex, Inc.
   4. Mechanical Sleeve Seals:
      a. Calpico, Inc.
      b. Metraflex Co.
      c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Specification piping Sections for pipe and fitting materials and joining methods, if applicable.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Specification piping Sections for special joining materials not listed below, if applicable.

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. ASTM B 32, 95/5 lead-free alloys. Include water –flushable and soluble flux according to ASTM B 813.

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. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564, medium bodied (bond). Include purple primer according to ASTM F 656.

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 Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature, to prevent galvanic action and stop corrosion. Unions in first paragraph below are available in at least NPS 1/2 to NPS 2.

B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Capitol Manufacturing Company.
      b. Central Plastics Company.
      c. EPCO Sales, Inc.
      d. Hart Industries International, Inc.
      e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      f. Zurn Plumbing Products Group; Wilkins Water Control Products.
   2. Description:
      a. Pressure Rating: 250 psig at 180 deg F.
      b. End Connections: Solder-joint copper alloy and threaded ferrous.
      c. Flanges in first paragraph below are available in at least NPS 1-1/2 to NPS 4.

C. Dielectric Flanges:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Capitol Manufacturing Company.
      b. Central Plastics Company.
      c. EPCO Sales, Inc.
      d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   2. Description:
      a. Factory-fabricated, bolted, companion-flange assembly.
      b. Pressure Rating: 175 psig minimum.
      c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calico, Inc.
      c. Central Plastics Company.
      d. Pipeline Seal and Insulator, Inc.
   2. Description:
      a. Nonconducting materials for field assembly of companion flanges.
      b. Pressure Rating: 150 psig.
      c. Gasket: Neoprene or phenolic.
      d. Bolt Sleeves: Phenolic or polyethylene.
      e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Calpico, Inc.
      b. Lochinvar Corporation.
   2. Description:
      a. Galvanized-steel coupling.
      b. Pressure Rating: 300 psig at 225 deg F.
      c. End Connections: Female threaded.
      d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Perfection Corporation; a subsidiary of American Meter Company.
b. Precision Plumbing Products, Inc.
c. Victaulic Company.
2. Description:
a. Electroplated steel nipple complying with ASTM F 1545.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Male threaded or grooved.
d. Lining: Inert and noncorrosive, propylene.

2.5 DIELECTRIC ISOLATION TAPE

A. Tape to eliminate dissimilar metal contact: (equal to Holdrite #272-4)
1. White Polyester Felt. Pressure sensitive adhesive rubber base (one side only).
2. 4” width.

2.6 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. 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.

2.7 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe materials and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.8 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. Sleeve Fasteners: Manufactured, steel clips for securement during pour. Equal to B-line, BD40, BE-5-8 or BE-9-12.

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. (split face acceptable for existing piping)
   a. Finish: Polished chrome-plate.

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.

2.10 ACCESS DOORS

A. General: Provide access doors for all serviceable mechanical appurtenances (valves, trap primers, shock arresters, actuators, sensors, etcetera) in inaccessible locations. Such locations include gypsum, brick and CMU ceilings and walls.

B. Location of panels shall be carefully coordinated with other Exposed Devices as described in earlier paragraphs.

C. Manufacturers shall be Milcor, Mifab, or approved equal. Unless indicated otherwise, use panels equal to Milcor Style M for masonry and drywall construction, equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile.

D. Minimum construction features include 16-gage frame and door, continuous hinges, cam-style latch and 10”x10" unobstructed opening size.

E. UL labeled when in fire-rated construction, one and one-half hour rating.

F. Access doors located outside, in restrooms or in a moisture-laden environment (dressing area, shower area, lockers, etcetera) shall be stainless steel construction.

G. Equipment access doors shall be of sufficient size to remove/replace equipment and provide routine maintenance as necessary, unless otherwise noted. Doors shall be set flush with adjacent finish surfaces. All access doors shall be provided with cylinder locks. All access doors (MEP) shall have one (1) common key.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS AND APPLICATIONS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual 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. All piping to be installed in compliance with current NEC required clearances.

D. Install manufactured isolation clamps at all dissimilar metal pipe supports. Install dielectric isolation tape (engineer approved) only when a manufactured isolation clamp is not available.

E. Install piping at indicated slope.

F. Install components with pressure rating equal to or greater than system operating pressure.

G. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

H. Install piping free of sags and bends.

I. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

J. 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.

K. Install piping to allow application of insulation plus 1-inch clearance around insulation.

L. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

M. Install fittings for changes in direction and branch connections.

N. Install couplings according to manufacturer's written instructions.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.
   1. Fire-stop all sleeves at floor penetrations of multistory buildings including underfloor penetrations.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

R. 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. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

5. 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.
6. 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.
7. 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.
8. 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. CPVC Piping: ASTM D 2846 and ASTM F 493.
   c. PVC Pressure Piping: ASTM D 2672.
   d. PVC Nonpressure Piping: ASTM D 2855.
9. 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.

3.2 ESCUTCHEON REQUIREMENTS

A. Install escutcheons at pipe penetrations of walls, ceilings, and floors in finished areas.
   1. Escutcheons for New Piping:
      a. Piping exposed through floors and walls in finished areas: One piece, cast brass with polished chrome-plated finish with set screw. Deep escutcheons to be provided where standard depth will not fit.
      b. Escutcheons shall cover entire hole penetration.
      c. Escutcheon to be appropriately sized for pipe.
   2. Escutcheons for Existing piping:
      a. Piping exposed through floors and walls in finished areas: Split plate, cast brass with polished chrome-plated finish with set screw. Deep escutcheons to be provided where standard depth will not fit.
      b. Escutcheons shall cover entire hole penetration.
      c. Escutcheon to be appropriately sized for pipe.
   3. 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.

3.3 PIPE SLEEVE INSTALLATION REQUIREMENTS

A. Pipe sleeves are required at all through wall and floor penetrations.
   1. Sleeves are to be of the following material:
      a. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.
   2. Sleeves are required for all through floor and wall penetrations. Sleeves to be set and poured in place (in slab applications), secure all sleeves with fasteners.
   3. Sleeves to extend 2 inches past face of floor or wall. Pipe sleeve in finished areas to be flush with wall or floor for installation of escutcheon.
   4. Install sleeves in new partitions, slabs, and walls as they are built.
   5. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.
   6. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.
   7. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.
   8. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated. Seal annular space with water tight sealant. (equal to NP-1). All sleeves and penetrations to maintain rating of wall / floor. Seal pipe penetrations with fire-stopping materials.
   9. Install sleeve materials according to the following applications:
      a. Sleeves for Piping Passing through Concrete Floor Slabs: galvanized steel pipe.
      b. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe sleeves.
         1) Extend sleeves 2 inches above finished floor level.
         2) For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
   10. Sleeves for Piping Passing through Gypsum-Board Partitions:
      a. Galvanized-steel pipe sleeves.
      b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
   11. Sleeves for Piping Passing through Concrete Roof Slabs: Reference details.
   12. Sleeves for Piping Passing through Exterior Concrete Walls:
      a. Galvanized-steel pipe sleeves.
      b. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
   13. Sleeves for Piping Passing through Interior Concrete Walls:
      a. Galvanized-steel pipe sleeves.
   14. Mechanical sleeve seals
      a. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building. Sleeves must be poured in place. Installation of sleeves after wall is constructed is not acceptable.
      b. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

B. 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.

3.4 DIELECTRIC FITTING INSTALLATION

A. 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.

B. 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.

3.5 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.

3.6 PAINTING AND FINISHING

A. 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.

B. Do not paint piping specialties with factory-applied finish.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 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."

3.8 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 (not to be used at pipe supports).

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.

3.9 DEMOLITION

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 CUTTING AND PATCHING

A. Disconnect, demolish, and remove Work specified in Plumbing 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.

3.11 GROUTING

A. Install nonmetallic, nonshrink, grout for plumbing 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

SECTION 22 0519

METERS AND GAGES FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following meters and gages for plumbing systems:
   1. Thermometers.
   2. Gages.
   3. Test plugs
   4. Flow indicators.
   5. Temperature and Pressure Test Kit

B. Related Sections include the following:
   1. Specification Section "Domestic Water Piping" for domestic water appurtenances.

1.2 SUBMITTALS

A. Product Data: For each type of product to be installed.

B. Operation and Maintenance Data: For all products to be 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 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers:
   1. Palmer - Wahl Instruments Inc.
   2. Trerice, H. O. Co.
   3. Weiss Instruments, Inc.
   4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Black-finished Aluminum, 9 inches long.

C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently baked on scale markings on lens (U.V. protected).

E. Window: Glass.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Brass for thermowell installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 THERMOWELLS

A. Manufacturers:
1. Palmer – Wahl Instruments Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Manufacturers: Same as manufacturer of thermometer being used.

C. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer. Provide extended neck to accommodate insulation thickness.

2.4 PRESSURE GAGES

A. Manufacturers:
1. Palmer – Wahl Instruments, Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Direct Mounting, Dial-type Dry or Liquid Filled Pressure Gages: Indicating-dial type complying with ASME B40.100.
1. Case: Dry or Liquid-filled type, stainless steel, 4-inch diameter. Weatherproof.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with baked on scale markings.
6. Pointer: Red or other dark-color metal.
7. Window: Glass
8. Ring: Stainless
9. Accuracy: Grade B, plus or minus 2 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range of Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:
1. Valves: NPS ¼ brass or stainless-steel needle type.
2. Syphons: NPS ¼ coil of brass tubing with threaded ends.
3. Snubbers: ASME B40.5,NPS ¼ brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.5 TEST PLUGS (PT PORTS)

A. Manufacturers:
1. Palmer – Wahl Instruments, Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.

4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F

D. Core Inserts: One or two self-sealing rubber valves.
1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

2.6 FLOW INDICATORS

A. Manufacturers:
1. Dwyer Instruments, Inc. (Series SFI-800 ONLY)

B. Description: Instrument for installation in piping systems for visual verification of flow. Rated for potable water applications.

C. Construction: Polysulfone body; with polysulfone sight glass and white polysulfone paddle-wheel indicator, and threaded ends.

D. Pressure Rating: 150 psig.

E. Temperature Rating: 212 deg F.

F. End Connections for NPS 3/4 and Smaller: Threaded.

2.7 TEMPERATURE AND PRESSURE TEST KIT

A. Test Kit: Furnish (1) test kit containing one pressure gage and adaptor, two (2) thermometers, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.
1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch diameter dial and probe. Dial range shall be 0 to 200 psig.
2. Low-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial ranges shall be 25 to 125 deg F.
3. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.
4. Carrying case shall have formed instrument padding.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install liquid-in-glass thermometers in the following locations:
1. Inlet and outlet of each storage tank.
2. Outlet of all domestic water heaters or boilers.
3. On hot water return line after circulation pump.
4. At the following locations for mixing valves:
a. HW (inlet to valve).
b. HWR (inlet to valve).
c. Tempered (outlet of valve).

B. Provide the following temperature ranges for thermometers:
   1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions.
   2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.

3.2 PRESSURE GAGE APPLICATIONS

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve and inlet and outlet of all backflow preventers (Domestic water).

B. Dry type pressure gages to be used on domestic water systems (inlet and outlets of heaters mixing valves, booster pumps and water softeners).

3.3 FLOW INDICATOR APPLICATION

A. Install wheel type indicator on outlet side of each domestic pump (recirculation or booster).

3.4 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated.

C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

D. Install ¼" NPT, ¼ turn ball-valve and snubber fitting in piping for each pressure gage for fluids.

E. Install test plugs in tees in piping.

F. Install flow indicators, in accessible positions for easy viewing, in piping systems.

3.5 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

3.6 ADJUSTING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Bronze ball valves.
2. Ductile iron Butterfly valves.
3. Bronze swing check valves.
4. Iron swing check valves.
5. Bronze globe valves.
6. Ductile iron globe valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated and required accessories (chains, extensions, etc.).

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valve Action: Close rotation shall be clockwise.

F. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation. Extension to be provided by valve manufacturer to match specific product.
2. Butterfly Valves: With extended neck.

G. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves (with 316 stainless steel bolts).
2. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.
c. Mueller Steam Specialty; a division of SPX Corporation.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel, blowout-proof.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 BUTTERFLY VALVES

A. 200 CWP, Ductile Iron, Lug Style-Flanged Butterfly Valves, potable rated:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.
c. Mueller Steam Specialty; a division of SPX Corporation.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum Bronze
h. Flange bolts to be 316 stainless steel.

2.4 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.
c. Mueller Steam Specialty; a division of SPX Corporation.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.5 IRON SWING CHECK VALVES

A. Class 250, Iron Swing Check Valves with Metal Seats, potable rated:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.
c. Mueller Steam Specialty; a division of SPX Corporation.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 500 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Flange bolts to be 316 stainless steel.

2.6 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.
c. Mueller Steam Specialty; a division of SPX Corporation.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.7 DUCTILE IRON GLOBE VALVES

A. Class 150, Ductile Iron Globe Valves, potable rated:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Milwaukee Valve Company.

c. Mueller Steam Specialty; a division of SPX Corporation.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A395, ductile iron.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: PTFE.
g. Flange bolts to be 316 stainless steel.

2.8 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries.
3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve.
4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Install valves with brass short nipples and brass unions at downstream side (outlet) of ball and globe valves (NPS 2 and smaller).

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem and handle movement. Valve handle to have ample clearance to be fully exercised without interference (full open and full closed) with no modifications to handle.

F. Install chainwheels on operators for butterfly valves NPS 4 and larger and more than 120 inches above finished floor. Extend chains to 96 inches above finished floor.

G. All valves NPS 3 and smaller shall be installed within 120 inches above finished floor.

H. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.

I. For all valves on insulated piping, provide insulated stem extension.

J. Install shutoff valves immediately upstream of each dielectric fitting.

K. Provide and install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops.

L. Provide and install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
   1. Drain Valves (At low points in water mains, risers, and branches): Ball valves

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

B. Perform the following adjustments before operation:
   1. Open shutoff valves to fully open position.
   2. Remove and clean strainer screens. Close drain valves and replace drain plugs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Valve applications, use the following:
   1. Shutoff Service: Ball, butterfly valves.
   2. Butterfly Valve Dead-End Service: Flange (lug) type.
   3. Throttling Service: Globe valves.
   4. Pump-Discharge Check Valves:
      a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
   2. For Copper Tubing, NPS 2-1/2 and larger: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
   4. For Steel Piping, NPS 2-1/2 and larger: Flanged ends.

3.5 VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Ball Valves: Two piece, full port, bronze with stainless-steel trim; **with brass short nipple and brass union connection at downstream side (outlet).**
   2. Bronze Swing Check Valves.
   3. Bronze Globe Valves: **With brass short nipple and brass union connection at downstream side (outlet).**

B. Pipe NPS 2-1/2 and Larger:
   1. Ductile Iron, Butterfly Valves.
   2. Iron Swing Check Valves.
   3. Ductile Iron Globe Valves.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment.
   1. Steel pipe hangers, supports and riser clamps
   2. Thermal-hanger shield inserts and saddles.
   3. Fastener systems.
   4. Pipe positioning systems.
   5. Equipment supports.

B. Related Sections include the following:
   1. All plumbing specification sections.

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 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. Weight loading for supports and hangers shall not exceed manufacturers recommended tolerances and limits.

1.5 SUBMITTALS

A. Product Data: For the following:
   1. Steel pipe hangers and supports.
   2. Thermal-hanger shield inserts and saddles.
   3. Powder-actuated fastener systems.
   4. Pipe positioning 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. 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 MATERIALS AND WORKMANSHIP

A. All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner’s Representative prior to bidding may be furnished.

B. Materials and equipment shall be installed in accordance with the manufacturer’s recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.

2.2 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.

2.3 METAL COATING REQUIREMENTS:

A. All metal products shall have the following coatings:
1. Wet/damp areas: hot dipped galvanized.
2. Dry or conditioned areas: pre-galvanized.

2.4 STEEL PIPE HANGERS, SUPPORTS AND RISER CLAMPS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 “Hangers and Support Applications” Article for where to use specific hanger and support types.

B. Manufacturers:
1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.
3. Grinnell Corp.

C. Galvanized, Metallic Coatings: Pre-galvanized (minimum thickness of 0.5 mils) or hot dipped (1.4 to 3.9 thickness).

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.

F. Channel, rod and securement hardware:
1. Channel: 12-ga.
2. Rod: Sized as scheduled.
3. Hardware (clamps, bolts, washers, etc): coating per area indication.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig minimum, compressive-strength insulation insert with a sheet metal shield.

B. Manufactures:
1. B-line
2. ERICO / Michigan Hanger CO
3. Grinnell Corp
4. Buckaroos

C. Insulation –Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier. Wood inserts are not acceptable.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type 1 calcium silicate or ASTM C 552, Type II cellular glass.

E. Insulation-Insert Material for Cold and Hot Piping, up to 3” diameter: Molded fiberglass block, 20 lbs/ft^3 density, thermal conductivity of 0.30.

2.6 FASTENER SYSTEMS

A. 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. Manufacturers:
a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Hilti, Inc.
c. Powers Fasteners.

B. Concrete Insert: electroplated steel finish, for embedding in concrete. Steel insert nut for rod attachment.
1. Manufacturers:
a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Hilti, Inc.
c. Powers Fasteners.

2.7 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:
1. C&S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.

3. Samco Stamping Inc.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes and bars. Galvanized only. Painted steel not acceptable.

PART 3 - EXECUTION

3.1 HANGERS AND SUPPORTS APPLICATIONS AND INSTALLATION

A. Specific hanger and support requirements are specified in Hanger Application Schedule below.

B. 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 form building structure; attaching to metal roof decks is not permissible.

C. Use hangers and supports with galvanized, metallic coatings for piping. Field applied finish is not acceptable.

D. Use nonmetallic plastic coating, jacket or liner 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. Rod to be installed plumb. Bending rod is not acceptable. Provide and install required attachments.

G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Heavy Duty Steel Clevis Hangers: For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.
   2. Strut System Clamps: For attachment of piping to channel. NPS ½ to NPS 2.
      a. Noninsulated copper piping to have dielectric insert. (dielectric tape not acceptable).
   3. 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.
      a. 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.
      b. Field fabricate from ASTM A 36/A 36M, steel shapes selected for lads being supported. Weld steel according to AWS D1.1.
   4. Install hangers for piping with the following maximum horizontal spacing and minimum rod diameters (hangers shall be spaced to prevent sagging):
      a. NPS 2 and Smaller: 60 inches with 3/8-inch rod.
      b. NPS 2-1/2 to 5: 60 inches with 1/2-inch rod.
      c. NPS 6 to 8: 60 inches with 3/4-inch rod.

H. Vertical-Piping Riser Clamps: Unless otherwise indicated and except as specified in piping system Section, install the following types:
   1. Required at all risers from under-floor or through floors from floor below. Risers clamps to be installed every 10 ft max. Coordinate installation with sleeves.

I. Building and Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Wide Jaw C-Clamps: For structural shapes, with retaining clip.
   2. NPS 2 and smaller: mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
   3. NPS 2 ½ and larger: Concrete spot insert. Install building attachments within concrete slabs. Install additional attachments at concentrate loads, including valves, flanges and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Insulation Piping Installation:
   1. Provide manufacture galvanized metal shield with locking tabs or securement band.
   2. For Trapeze or Clamped Systems: Thermal insert and shield shall cover entire circumference of pipe.
   3. For Clevis or Band Hangers: Thermal insert and shield shall cover lower 180 degrees of pipe.
   4. Thermal Insert Length: Extend 4 inches beyond sheet metal shield for piping operating below ambient air temperature.

K. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures; minimum three (3) for vertical pipe sections.

L. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer Specification Section "Plumbing Fixtures" for plumbing fixtures.

M. Install hangers and supports complete with necessary inserts, bolts, rods, nuts washers and other accessories.

N. Load Distribution: Install hangers and supports so piping live and dead loads and stressed 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 B31.9 (for building services piping) are not exceeded.

3.2 EQUIPMENT SUPPORTS

A. Manufacturer's structural-steel system to suspend equipment from structure overhead or to support equipment above floor.

3.3 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 inch.

3.4 PAINTING

A. Repair Galvanized Surfaces: Clean welds, bolted connections and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels
3. Pipe labels.
4. Valve tags.
5. Warning 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. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, **1/8 inch** thick, and having predrilled holes for attachment hardware.
2. Letter Color: **White.**
3. Background Color: **Black.**

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel **rivets or self-tapping screws**.

B. 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.

C. 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 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-Steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to cover full 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 label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engrave with ¼ inch letters piping system abbreviation and ½ inch numbers.

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 a 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 date.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, or plasticized card stock with matte finish suitable for writing.
   1. Size: Approximately 4 by 7 inches.
   2. Fasteners: Brass grommet and wire.
   3. Nomenclature: Large-size primary caption such as “DANGER”, “CAUTION”, OR “DO NOT OPERATE”.
   4. Color: yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces or substances that could impair band 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. Piping Color-Coding: Painting of piping is specified in Specification Section “Interior Painting”.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings and inaccessible enclosures.
4. At access doors, manholes and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:
1. Domestic Water Piping:
   a. Background Color: Blue.
   b. Letter Color: White.
2. Domestic Hot Water Piping:
   a. Background Color: Red.
   b. Letter Color: White.
3. Sanitary Waste and Vent and Storm Drainage Piping:
   a. Background Color: Green.
   b. Letter Color: White

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and controls devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; 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:
1. Valve-Tag Size and Shape:
   a. Cold Water: 1-1/2 inches round.
   b. Hot Water: 1-1/2 inches square.
2. Valve-Tag Color:
   a. Cold Water: Blue.
   b. Hot Water: Orange.
3. Letter Color:
   a. Cold Water: Black.
   b. Hot Water: Black

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 22 0716

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 plumbing insulation for equipment and pipe, including the following:
   1. Insulation Materials:
      a. Cellular glass.
      b. Flexible Elastomeric.
      c. Mineral fiber.
      d. Phenolic
   2. Adhesives.
   3. Mastics.
   4. Sealants.
   5. Factory-applied jackets.
   6. Field-applied tape.
   7. Field-applied jackets.
   8. Securements.

B. Related Sections include the following:
   1. Specification Section “Hangers and Supports” for high-density inserts at hangers; **wood inserts at hangers are not acceptable.**
   2. Specification Section “Special Conditions for All Plumbing Work”.
   3. Specification Section “Basic Plumbing Materials and Methods”.

C. Not all items listed within this specification are used. Use only items applicable per application schedule.

1.3 DEFINITIONS

A. ASJ: All-service jacket.

B. CONCEALED: Covered or concealed by a ceiling (gypsum or lay-in acoustical tile) or wall.

C. EXPOSED: Open to view; not concealed by a ceiling or wall of any sort.

D. FSK: Foil, scrim, kraft paper.

E. UNDERFLOOR: Accessible crawl space beneath lowest floor level (considered “outdoors”).

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). Provide submittal data on all products to be used.

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.

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.

B. All products to be stored in a dry location, protected from the elements. All damaged insulation to be replaced.

1.7 COORDINATION

A. Coordinate size and location of supports, hangers, and high-density insulation inserts and shields specified in Specification Section "Hangers and Supports." Coordinate with drawing details where applicable; wood inserts at hangers are not acceptable.

B. Coordinate clearance requirements with piping Installer for piping insulation application, and equipment Installer for equipment insulation application. Before preparing piping 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 and, where required, after installing and testing heat tracing. 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.

C. Insulation not to be installed until building is dried in.

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 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. Phenolic:
1. Products
   a. Insul-phen
2. 100% CFC-free, HCFC-free, and halogen-free, closed cell rigid phenolic foam insulation.
3. Minimal thermal conductivity @ 75˚ F.
   a. Green, 2.5 lb/ft³. 0.15 (Btu.in/hr.ft².F)
   b. Pink, 5.0 lb/ft³. 0.21 (Btu.in/hr.ft². F)

G. Cellular Glass:
1. Products:
   a. Pittsburgh Corning Corporation; Foamglas Super K.
2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
7. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Minimal thermal conductivity at 75˚ F of 0.29 (Btu.in/hr.ft². F) (R-value of 10.34@ 3 inches thickness). Factory-applied jacket requirements are specified in Part 2 “Factory-Applied Jackets” Article.

H. Flexible Elastomeric:
1. Products:
   a. Aeroflex USA Inc.; Aerocel.
   b. Armacel LLC; AP Armaflex.
2. Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
3. Minimal thermal conductivity at 75˚ F of 0.25 (Btu.in/hr.ft². F.)

I. Mineral-Fiber Blanket Insulation:
1. Products:
   a. Johns Manville; Microlite.
   b. Knauf Insulation; Duct Wrap
   c. Owens-Corning; All-Service Duct Wrap.
2. 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 FSP jacket. Factory-applied jacket requirements are specified in Part 2 “Factory-Applied jackets” Article.

J. Mineral-Fiber, Preformed Pipe Insulation:
1. Products:
a. Johns Manville; Micro-Lok.
b. Knauf Insulation; 1000° Pipe Insulation.
c. Owens Corning; Fiberglas Pipe Insulation.
2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

K. Fire Rated Wrap
1. Manufacturers:
a. 3M
b. Specialty Products and Insulation Co.
2. Insulation Materials: Fire rated fiber wrap insulation: 1-1/2 inch thick low bio-persistent Alka-line Earth Silicate fiber with melting point at 2200 degrees F. jacket shall be foil faced (one side) Kraft fiber paper with a concealed reinforcing scrim. (FSK) One hour rating with 1-layer of wrap, 3 inches to combustibles. Two hour rating with 2 layers of wrap, 0 inch to combustibles.
3. Accessories and Attachments:
a. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq.yd.
1) Tape Width: 4 inches.
b. Bands: 3/4 inch wide, in one of the following materials compatible with jacket.
1) Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
c. Insulation Anchor Pings and Speed Washers: Galvanized steel plate, pin and washer manufactured for attachment to duct by weld. Pin length sufficient for insulation thickness indicated.
d. Vapor Retarders: Mastics: Materials recommended by insulation material manufacturers that are compatible with insulation materials, jackets, and substrates.
4. Secured per manufacturer’s requirements and AHJ.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated. All products are to contain low V.O.C. as defined/governed by LEED IEQ 4.1 and 4.2 (Regardless of project type).

B. Cellular-Glass, Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
1. Products:
a. Foamglas: Pittseal 444N or equal

C. Flexible Elastomeric: Comply with MIL-A-24179A, Type II, Class I.
1. Products:
a. K-Flex: 720 LVOC or equal

D. Phenolic: Water based adhesive with a service temp of minus 20°F to 700°F.
1. Products:
a. Foster 97-15

E. Metal Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products:

a. Design Polymerics, DP2502 (or approved equal).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II. All products are to contain low V.O.C. as defined/governed by LEED IEQ 4.1 and 4.2 (Regardless of project type).

B. Vapor-Barrier Mastic: Water based; suitable for outdoor use on below ambient services, or indoor vapor barrier use.
   1. Products:
      a. Childers Products, Division of ITW; CP-35.
   2. Water-Vapor Permeance: ASTM F 1249, 0.09 perm at 55-mils film thickness.
   3. Service Temperature Range: Minus 20 to plus 190 deg F.
   4. Solids Content: ASTM D 1644, 60 percent by volume and 73 percent by weight.
   5. Color: White.
   6. VOC: 36 g/l.

2.5 SEALANTS

A. Joint Sealants:
   1. Joint Sealants for Cellular-Glass Products:
      a. Pittsburgh Corning Corporation; Pittseal 444N.
   2. Joint Sealant for Phenolic Products
      a. Foster 95-50

B. Metal Jacket:
   1. Products:
      a. Foster 95-44 or equal.
      b. Childers Products, Division of ITW; CP-76.

C. Mineral Fiber:
   1. Design Polymerics DP 2502.
   2. Childers Products, Division of ITW; CP-35.

D. PVC Jacket:
   1. Childers Products, Division of ITW; CP-35.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, 25/50 ASTM-F 84, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Products:
      a. Johns Manville; Zeston.
      b. Proto PVC Corporation; LoSmoke.
   2. Adhesive: As recommended by jacket material manufacturer.
   3. Color: White:
   4. 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.
   5. Factory-fabricated tank heads and tank side panels.

C. Metal Jacket:
   1. Products:
      a. Childers Products, Division of ITW; Metal Jacketing Systems.
      b. PABCO Metals Corporation; Surefit.
      c. RPR Products, Inc.; Insul-Mate.
   2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.
      a. Factory cut and rolled to size.
      b. Finish and thickness are indicated in field-applied jacket schedules.

2.8 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: 14.0 mils.
   3. Adhesion: 73 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 55 lbf/inch in width.
   6. Color: White

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: 13 mils.
   3. Adhesion: 73 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. Color: Silver

2.9 SECUREMENTS

A. Bands:
   1. Products:
      a. Childers Products; Bands.
   2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 316; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
   3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch with wing or closed seal.

4. 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. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel.

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. For Stainless Steel; apply a corrosion coating to insulated surfaces with an epoxy primer and an epoxy finish 5 mils thick.

B. Verify and coordinate insulation installation with the systems and trades installing heat tracing. Comply with requirements for heat tracing that applies to insulation.

3.3 COMMON INSTALLATION REQUIREMENTS

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. 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

C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, and pipe system as specified in insulation system schedules.

D. 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.

E. Install high-density inserts at hanger locations prior to insulating; wood or block inserts are not acceptable

F. Do not weld brackets, clips, pins or other attachment devices to piping, fittings, tanks, coils, equipment, vessel, and specialties.

G. Keep insulation materials clean and dry before, during application, and finishing.

H. Install insulation with tight longitudinal seams and end joints, with least number of joints practical.

I. Install insulation so that material is not over compressed.

J. Seal all joints, and seams, including penetrations in insulation, at supports, and other projections with insulation of same material overlapped by 2". Secure strips with outward clinching staples along both edges of strip, (spaced 1 inch on center) and seal entire joint or seam with mastic.

K. Do not insulate, conceal, or enclose pipe hangers, channel and steel supports, etc. not directly fasten to duct.

L. 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.

M. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses. Do not water down products unless directed by manufacture. Use clean potable demineralized water when required.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair all damage insulation prior to concealment as noted above.

P. Do not insulation or conceal vibration-control devices, labels, stamps, nameplates, data plates, manholes, cleanouts, etc. require for maintenances.

Q. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarded integrity, unless otherwise indicated.

R. Insulate pipe elbows, tees, valves, strainers, flanges, etc., using preformed fitting insulation, mitered fittings or oversized preformed pipe insulation made from same material thickness and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. 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, voids, and irregular surfaces with insulating mastic finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation. Provide a removable reusable insulation cover; design that maintains vapor barrier. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts.

S. Cover segmented insulated surfaces with a layer of finishing mastic prior to jacket installation.

T. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Secure PVC covers to adjoining insulation facing using staples and ASJ tape. Seal PVC fitting covers with mastic.

U. 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 adhesive and finish with finishing mastic. All connections are to be accessible.

V. Install removable insulation segment and covers at flanges, valves, controls, unions, equipment access doors, manholes, hand holes, and other elements that require frequent removal for service and inspection. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.4 PENETRATIONS

A. Install insulation continuously through all walls, floors, and partitions penetrations and sleeves.

B. Extend jacket of outdoor installation into wall and roof jacks by 2 inches. Seal jacket to roof flashing with approved flashing sealant.

C. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with approved flashing sealant.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Preformed Pipe Insulation Installation on Pipe, Fittings, Valves, Flanges, Tanks, Elbows, and Appurtenances for Cellular- Glass, Mineral- Fiber, Flexible Elastomeric, and Phenolic insulations:
   1. Install insulation in a manner that secures material to system being insulated with staples, tape and mastic.
   2. When insulation with preformed pipe insulation, seal all longitudinal seams, end joints, and protrusions with manufacturers recommended tape matching jacket, vapor-barrier mastic, joint sealant, and adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
   3. Secure fittings, jacket, cover, etc. with tape matching jacket and secure with outward clinched staples 1 inch on center. Apply vapor-barrier mastic over staples.
   4. Arrange insulation to permit access to valves packing, flanges, unions, etc. and valve operation for maintenance without disturbing insulation. Install insulation so that it can be removed without damage to surrounding insulation or access enclosure.
   5. Pipe hangers are not to be concealed in insulation.
   6. Seal all exposed insulation ends with mastic.
   7. Seal all mitered joints prior to installing covers with vapor-barrier mastic.
   8. Install preformed pipe insulation to outer diameter of pipe flange.
   9. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   10. Fill voids between inner circumference of valves, flange, elbows, and bolts insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
   11. Install preformed sections of same material insulation when available. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Install PVC cover over fitting or mitered section.
   12. Arrange insulation to permit access to valves packing, flanges, unions, etc. and valve operation for maintenance without disturbing insulation. Install insulation so that it can be removed without damage to surrounding insulation or access enclosure.

3.6 GENERAL BLANKET INSULATION INSTALLATION (IN ADDITION TO COMMON REQUIREMENTS)

A. Blanket Insulation Installation on Pipes, Drains, Tanks, Vessels, Elbows, and Appurtenances:
   1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for a minimum of 50 percent coverage of insulated surface and 100 percent coverage of equipment, tanks, etc.; to secure insulation to surfaces. Apply adhesive to entire circumference of all surfaces; including fittings and transitions.
   2. Install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation

segment. Secure laps to adjacent insulation section with 3/4-inch outward-clinching staples, 1 inch on center. Coat all seams/joints with mastic.

3. Repair punctures, tears, penetrations and protrusions with 6-inch-wide strips of same material used to insulate duct. Seal all seams with staples, cover with mastic and cover with embedded fiberglass reinforced mesh, cover mesh with finish coat of mastic.
4. Do not conceal hangers beneath/under insulation.
5. Insulation termination: Butt insulation up to termination point. Apply mastic no less than 3" overlap on insulation, and 3" on metal surface.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. 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. Apply two continuous beads of sealant to seams and joints, one bead under lap and the finish bead along seam and joint edge. Secure metal jacket with stainless-steel bands 12 inches on center and at end joints.

3.8 FINISHES

A. Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in painting Sections (if applicable).
   1. Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Inspect insulated pipe, and equipment, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two (3) location(s) for each system.
   2. All insulation applications will be considered defective work if sample inspection reveals noncompliance with requirements.
   3. Remove all defective work and install new insulation and jackets to replace insulation and jackets removed for inspection. Repeat inspection procedures as needed.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor’s option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Fire-suppression piping.
   2. Drainage piping located in crawl spaces.
   3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water:
1. Concealed Locations:
a. 0 through 1-1/4" Pipe Size: Insulation shall be any of the following:
1) Mineral Fiber Preformed: Type 1: 1-inch thick.
2) Phenolic (2.5 lb/ft³), 1-inch thick.
3) Cellular Glass: 1-1/2 inches thick.
b. 1-1/2" and Larger Pipe Size: Insulation shall be any of the following:
4) Mineral Fiber Preformed: Type 1: 1-1/2"-inch thick.
5) Phenolic (2.5 lb/ft³), 1-1/2"-inch thick.
6) Cellular Glass: 1-1/2 inches thick.

2. Exposed Locations: (including inside mechanical rooms):
a. 0 through 1-1/4" Pipe Size: Insulation shall be any of the following:
1) Phenolic (3.5 lb/ft^3), 1-inch thick.
2) Cellular Glass: 1-1/2 inches thick.
3) Mineral Fiber Preformed: Type 1: 1-inch thick.
b. 1-1/2" and Larger Pipe Size: Insulation shall be any of the following:
4) Phenolic (3.5 lb/ft^3), 1-1/2-inch thick.
5) Cellular Glass: 1-1/2 inches thick.
6) Mineral Fiber Preformed: Type 1: 1-1/2"-inch thick.

B. Condensate, Equipment Drain, Floor Drains, Traps and Waste Water below 60 Deg F:
1. All PVC Piping exposed to and in a Return Air Plenum: Insulation shall be any of the following:
a. Fire rated wrap.
2. All Other Pipe: Insulation shall be any of the following:
a. Cellular Glass: 1-1/2 inches thick.
b. Phenolic (2.5 lb/ft³): 1-1/2 inches thick.

C. Horizontal Storm Water Piping:
1. All PVC Piping exposed to and in a Return Air Plenum: Insulation shall be any of the following:
a. Fire rated wrap.
2. All Other Pipe: Insulation shall be any of the following:
a. Cellular Glass: 1-1/2 inches thick.
b. Phenolic (2.5 lb/ft³): 1-1/2 inches thick.
c. Mineral Fiber, Preformed, Type 1: 1-inch thick.

D. Roof Drain Body:
1. PVC Roof Drain Body exposed to and in a Return Air Plenum: Insulation shall be any of the following:
a. Fire rated wrap.
2. All Other Roof Drain Bodies: Insulation shall be any of the following:
a. Mineral-Fiber Blanket Insulation: 1-1/2 inch thick.

E. Sanitary Waste & Vent; Domestic Waterpiping:
1. All PVC Piping exposed to and in a Return Air Plenum: Insulation shall be any of the following:
a. Fire rated wrap.

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE (ATTIC AND CRAWL SPACE INCLUDED)

A. Domestic Cold, Hot and Recirculated Hot Water:
   1. All Pipe Sizes: Insulation shall be any of the following:
      a. Preinsulated Pipe: 1-1/2" thick (underfloor, outdoors and buried)
      b. Cellular Glass: 2 inches thick (outdoors, not acceptable indoors)
      c. Phenolic (5 lb/ft³): 2 inches thick (outdoors, not acceptable indoors)
      d. Mineral Fiber Preformed, Type 1: 1-1/2 inch thick (uninsulated Attic space)

B. Condensate, Equipment Drain, Floor Drains, Traps and Waste Water below 60 Deg. F:
   1. All Pipe Sizes: Insulation shall be any of the following:
      a. Cellular Glass: 1-1/2 inches thick
      b. Phenolic (5 lb/ft³): 1-1/2 inches thick

C. Fire Protection:
   1. All Pipe Sizes: Insulation shall be any of the following:
      a. Cellular Glass: 1-1/2 inches thick
      b. Phenolic (5 lb/ft³): 1-1/2 inches thick

3.13 INSIDE EXTERIOR WALL PIPING INSULATION SCHEDULE

A. Domestic Cold, Hot and Recirculated Hot Water:
   1. All Pipe Sizes: Insulation shall be any of the following:
      a. Cellular Glass: 1-1/2 inches thick
      b. Phenolic (2.5 lb/ft³): 1 inch thick
      c. Mineral Fiber Preformed, Type 1: 1 inch thick, coat entire ASJ jacket with vapor mastic

B. Condensate, Equipment Drain, Floor Drains, Traps and Waste Water below 60 Deg. F:
   1. All Pipe Sizes: Insulation shall be any of the following:
      a. Cellular Glass: 1-1/2 inches thick
      b. Phenolic (2.5 lb/ft³): 1-1/2 inches thick

C. Fire Protection:
   1. All Pipe Sizes: Insulation shall be any of the following:
      a. Cellular Glass: 1-1/2 inches thick
      b. Phenolic (2.5 lb/ft³): 1-1/2 inches thick

3.14 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. Piping exposed in finish interior areas, outdoors, in underfloor, mechanical rooms:
   1. Aluminum, Stucco Embossed: 0.016 inch thick.

C. Indoor piping fitting or elbows:
   1. PVC: (0.015 inch thick).

END OF SECTION

SECTION 22 1116

DOMESTIC WATER PIPING

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. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
   2. Encasement for piping.

1.3 SUBMITTALS

A. Product Data: For the following products:
   1. Piping and fittings.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency. Origin of product to be domestic. No imported product will be acceptable.

B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61 for potable domestic water piping and components.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
   2. Do not proceed with interruption of water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L or K water tube, drawn temper.
   1. Copper Pressure Fittings: ASME B16.18, cast copper-alloy or ASME B16.22, wrought-copper, solder fittings.

B. Soft Copper Tube: ASTM B 88, Type L or K water tube, annealed temper.
   1. Copper Pressure Fittings: ASME B16.18, cast copper-alloy or ASME B16.22, wrought-copper, solder fittings.

C. Copper Pipe, Pre-insulated:
   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. Insul-Pipe Systems, Inc.
      b. Insul-tek
      c. Thermal Pipe Systems, Inc.
      d. Thermacor Process L.P.
   2. Description: Factory pre-insulated double-wall pipe system.
   3. Carrier Pipe: Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B).
   4. Wrought-Copper Fittings: ASME B16.22.
   5. Pipe Insulation: Foamed-in-place polyurethane, 90% closed cell, poured in place, "K" = 0.14 per inch @ 75 degrees F, with a density of not less than 2.5 lbs. per cubic foot. Insulation shall be completely encased within a seamless jacket.
      a. Insulation at each end of each length of pipe shall be protected with an end seal bonded both to the carrier pipe and the outer jacket. Piping cuts made in the field must be provided with end-seals equal to factory type.
      b. Insulation thickness, minimum: 1.12-inches for NPS 2 and smaller; 1.67-inches for NPS 2-1/2; 1.42-inches for NPS 3; 1.93-inches for NPS 4; and 1.93-inches for NPS 6.
   6. Jacket: PVC; ASTM D-1784, Class 12454-B, of not less than .060 inches thick and able to withstand H-20 highway loading.
   7. Fitting insulation: Coupling joints on straight runs shall be field wrapped with a mold/jacket of roll PVC, sealed with self seal tape and filled with field mixed pour polyurethane foam. Fittings shall be field insulated using a field mixed polyurethane poured between the fitting and a PVC fitting cover supplied by the manufacturer that is sealed with self seal tape. Vapor barrier jacketing material for fittings and joints shall be of the same material as the pipe jacketing. Installation shall be as per manufacturer's instructions.

2.3 NIPPLES

A. Brass Nipple: ASTM B687-88
   1. Threads: NPT (Federal Services Handbook H-28)
   2. Potable use.

2.4 UNIONS

A. Factory-fabricated, brass or bronze union assembly, for 150-psig minimum working pressure at 180 deg F, ASTM B687-88

B. End Connections: Solder-joint copper alloy and / or threaded ferrous.

C. Potable use.

2.5 FLANGES

A. Factory-fabricated, bronze union assembly, for 150-psig minimum working pressure at 180 deg F, ASME B16.24, Class 150.

B. End Connections: Solder-joint copper alloy and / or threaded ferrous.

C. Potable use.

D. All bolts to be 316 stainless steel (Class 150).

2.6 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Solder Filler Metals: ASTM B 32, 95/5 lead-free alloys. Include water-flushable and soluble flux according to ASTM B 813.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.7 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Form: Tube.

C. Material: LLDPE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.

D. Color: Black or blue.

2.8 TRANSITION FITTINGS

A. General Requirements:
1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Dresser Piping Specialties.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc; a Sensus company.
g. Viking Johnson; c/o Mueller Co.

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Charlotte Pipe and Foundry Company.
   b. Harvel Plastics, Inc.
   c. Spears Manufacturing Company.
2. Description: CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket end.

E. Plastic-to-Metal Transition Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Colonial Engineering, Inc.
   b. NIBCO INC.
   c. Spears Manufacturing Company.
2. Description: CPVC four-part union. Include brass threaded end, solvent-cement-joint plastic end, rubber O-ring, and union nut.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105.

D. Provide and install shutoff valve, strainer, pressure reducing valve, hose-end drain valve, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Section "Meters and Gages" for pressure gages and Section "Domestic Water Piping Specialties" for drain valves and strainers.

E. Install domestic water piping level and plumb.

F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

I. Install piping adjacent to equipment and specialties to allow service and maintenance.

J. Install piping to permit valve servicing.

K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

L. Install piping free of sags and bends.

M. Install fittings for changes in direction and branch connections.

N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty valves.

O. All pipe nipples to be brass.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join and prepare/clean copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

F. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

G. All piping is to be cleaned prior to concealment.

3.3 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. NPS 2 and Smaller: Fitting-type coupling.
   2. NPS 2-1/2 and Larger: mechanical joint-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition unions.

3.4 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to all equipment.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:
   1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by engineer and authorities having jurisdiction
   2. During installation, notify engineer and authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of engineer and authority having jurisdiction:
      a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange final inspection for engineer and authority having jurisdiction to observe tests specified below and to ensure compliance with requirements.
   3. Reinspection: If the engineer or authority having jurisdiction finds that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
   4. Reports: Prepare inspection reports and have them signed by engineer and authority having jurisdiction.

C. Piping Tests:
   1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
   3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   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 for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

B. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

C. Prepare and submit reports of purging and disinfecting activities.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.7 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions to be provided and installed at all equipment connections and appurtenances.

C. Underground, domestic water, building service and distribution piping, NPS 2 and smaller, shall be the following:
1. Soft copper tube, ASTM B 88, Type K; (continuous, no joints under slab.)

D. Aboveground and basement domestic water piping, all sizes, shall be the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.

END OF SECTION

SECTION 22 1119

DOMESTIC WATER PIPING SPECIALTIES

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 domestic water piping specialties:
1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Water hammer arresters (shock arrestors).
10. Trap-seal primer valves.
11. Flexible connectors.
12. Drain Valves.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

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. NSF Compliance:
1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.

2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers :
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Ames Co.
      b. Conbraco Industries, Inc.
      c. FEBCO; SPX Valves & Controls.
      d. Watts Industries, Inc.; Water Products Div.
      e. Woodford Manufacturing Company.
      f. Zurn Plumbing Products Group; Wilkins Div.
   2. Standard: ASSE 1001.
   3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
   4. Body: Bronze.
   5. Inlet and Outlet Connections: Threaded.
   6. Finish: Mechanical areas: Rough bronze. Finished areas: Chrome

B. Hose-Connection Vacuum Breakers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Conbraco Industries, Inc.
      b. MIFAB, Inc.
      c. Watts Industries, Inc.; Water Products Div.
      d. Woodford Manufacturing Company.
      e. Zurn Plumbing Products Group.
   2. Standard: ASSE 1011.
   3. Body: Bronze, non-removable, with manual drain.
   4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
   5. Finish: Rough bronze.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Ames Co.
      b. Conbraco Industries, Inc.
      c. FEBCO; SPX Valves & Controls.
      d. Watts Industries, Inc.; Water Products Div.
      e. Zurn Plumbing Products Group; Wilkins Div.
   2. Standard: ASSE 1013.
   3. Operation: Continuous-pressure applications.
   4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
   5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2and larger.
   6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
   7. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
b. Strainer: Y-pattern with threaded ends on inlet of NPS 2 and smaller.
c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check Backflow-Prevention Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications, unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Accessories:
a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

C. Pressure Type Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water back pressure.
4. Inlet Size: NPS 1/2 or NPS 3/4.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: Service line size.
5. Design Outlet Pressure Setting: 70 psig.
6. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.4 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Armstrong International, Inc.
b. ITT Industries; Bell & Gossett Div.
c. NIBCO INC.
d. Taco, Inc.
e. Watts Industries, Inc.; Water Products Div.
2. Type: Y-pattern globe valve with two readout ports and memory setting indicator.
3. Body: Bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Memory-Stop Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.
b. Milwaukee Valve Company.
c. NIBCO INC.
2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.5 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:
1. 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. Armstrong International, Inc.
b. Lawler Manufacturing Company, Inc.
c. Leonard Valve Company.
d. Powers; a Watts Industries Co.
e. Symmons Industries, Inc.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.

B. Manifold, Thermostatic, Water-Mixing-Valve Assemblies:
1. 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. Armstrong International, Inc.

b. Leonard Valve Company.
c. Powers; a Watts Industries Co.
d. Symmons Industries, Inc.

2. Description: Factory-fabricated, thermostatically controlled, water-mixing-valve assembly in two or three-valve parallel arrangement.
3. Large-Flow Parallel: Thermostatic water mixing valve and downstream pressure regulator with pressure gages on inlet and outlet.
4. Intermediate-Flow Parallel: Thermostatic water mixing valve and downstream pressure regulator with pressure gages on inlet and outlet.
5. Small-Flow Parallel: Thermostatic water mixing valve.
6. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
7. Water Regulator(s): Comply with ASSE 1003. Include pressure gage on inlet and outlet.
8. Component Pressure Ratings: 125 psig minimum, unless otherwise indicated.
9. Cabinet (where indicated): Factory-fabricated, stainless steel, for recessed or surface mounting (per drawing indication) and with hinged, stainless-steel door.
10. Performance characteristics and other requirements: Refer to drawings.

C. Individual-Fixture, Water Tempering Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Armstrong International, Inc.
b. Lawler Manufacturing Company, Inc.
c. Leonard Valve Company.
d. Powers; a Watts Industries Co.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1016, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:
a. Strainers NPS 2 and Smaller: 0.033 inch.
b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.7 HOSE BIBBS

A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.

4. Supply Connections: NPS 3/4 threaded -joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome plated.
11. Operation for Equipment Rooms: Metal wheel handle or operating key.
12. Operation for Service Areas: Metal wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome plated hose bibb.
16. Other requirements: Refer drawing schedules and provide equivalency to model and manufacturer listed.

2.8 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Watts Drainage Products Inc.
   e. Woodford Manufacturing Company.
   f. Zurn Plumbing Products Group.
2. Standard: ASME A112.21.3M for self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Other requirements: Refer drawing schedules and provide equivalency to model and manufacturer listed.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Woodford Manufacturing Company.
   e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.21.3M for self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Casings and Operating Rods: Of length required to match wall thickness. Include wall clamps.
5. Inlets: NPS 3/4 or NPS 1.
6. Vacuum Breaker: Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 and with garden-hose thread complying with ASME B1.20.7 on outlet.
7. Other requirements: Refer drawing schedules and provide equivalency to model and manufacturer listed.

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 600-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Bronze.
5. Ball: Stainless steel.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER HAMMER ARRESTERS (SHOCK ARRESTORS)

A. Water Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Josam Company.
b. MIFAB, Inc.
c. PPP Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.11 TRAP-SEAL PRIMER VALVES (TRAP PRIMERS)

A. Supply-Type, Trap-Seal Primer Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. MIFAB, Inc.
b. PPP Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Watts Industries, Inc.; Water Products Div.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Flushometer, Trap-Seal Primer Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Sloan Valve Company.
b. Zurn Plumbing Products Group; Commercial Brass Operation.
2. Standard: Vacuum breaker trap primer fitting that diverts a small amount of water with each flush; NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/2 minimum.

4. Material: Chrome-plated, cast brass.
5. Accessories: Chrome-plated wall flange, fittings and elbow.

C. Drainage-Type, Lavatory, Trap-Seal Primer Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.
4. Material: Chrome-plated, cast brass.

2.12 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings “Plumbing Fixture Schedule” or a comparable product by one of the following:
a. PPP Inc.
2. Standard: ASSE 1044,
3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
4. Cabinet: Recessed or Surface-mounting (per drawing indication) steel box with stainless-steel cover.
5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
6. Vacuum Breaker: ASSE 1001.
7. Number Outlets: Refer to drawings.
8. Size Outlets: NPS 1/2.

2.13 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flex-Hose Co., Inc.
2. Metraflex, Inc.

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.\

3. Install backflow preventers at 42-in above finished floor in an accessible location, preferably on a wall with galvanized steel channel and pipe strap support.
4. Do not install bypass piping around backflow preventers.
5. Provide and install threaded brass plugs for all test ports.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install water-pressure-reducing valves downstream from shutoff valves.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
1. Install water mixing valves at 42-in above finished floor in an accessible location, preferably on a wall with galvanized steel channel and pipe strap support.
2. Install thermometers and water regulators if specified.
3. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve, solenoid valve, and pump.

G. Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 06 Section "Rough Carpentry."

H. Install water hammer arresters in water piping according to PDI-WH 201 and applicable drawing details.

I. Install trap-seal primer valves without dedicated isolation valves; supply from nearest branch serving an occupant-use plumbing fixture. System style trap primer to have isolation valve.

J. Install supply- and drainage-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

K. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow. Install unit at a minimum of 36” AFF.

L. Provide and install a calibrated balancing valve in each hot-water circulation return loop. Verify that system flowrate is set and matches drawing requirements.

3.2 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge manifold connections to each domestic water booster pump.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:
1. Test and certify each backflow assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

D. Open throttling valves to proper setting.

E. Verify (by instrument flow testing) that auto-flow balancing valves in hot-water-circulation return piping are flowing specified gpm.

F. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

G. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

H. Check plumbing specialties and verify proper settings, adjustments, and operation.

END OF SECTION

SECTION 22 1316

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.

1.3 DEFINITION

A. Condensate Piping: Drainage piping that indirectly conveys clear-water condensate from air conditioning and refrigeration equipment to the sanitary drainage system.

B. Indirect Drainage Piping: Piping that conveys waste water from mechanical equipment, including cooling towers, evaporative coolers, evaporative condensers, chilled-water systems, etcetera, to the sanitary drainage system.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. LLDPE: Linear, low-density polyethylene plastic.

E. NBR: Acrylonitrile-butadiene rubber.

F. PE: Polyethylene plastic.

G. PVC: Polyvinyl chloride plastic.

H. TPE: Thermoplastic elastomer.

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. 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. Origin of product to be domestic. No imported product will be acceptable.

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 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 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 and CISPI 301 and marked with the collective trademark of the CISPI and listed by NSF International.

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. Coupling shall be listed by NSF International.
      a. Manufacturers:
         1) ANACO.
         2) Fernco, Inc.
         3) Ideal Div.; Stant Corp.
         4) Mission Rubber Co.
         5) Tyler Pipe; Soil Pipe Div.
   2. Heavy-Duty, Shielded, Stainless-Steel Couplings: ASTM C 1540, with stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve. Coupling shall be listed by NSF International.
      a. Manufacturers:
         1) ANACO.
         2) Clamp-All Corp.
         3) Ideal Div.; Stant Corp.
         4) Mission Rubber Co.
         5) Tyler Pipe; Soil Pipe Div.

2.4 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Extra-Heavy or Service class and marked with the collective trademark of the CISPI and listed by NSF International.

B. Gaskets: ASTM C 564 and ASTM C 1563, rubber.

C. Caulking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.5 STEEL PIPE AND FITTINGS

A. Steel Pipe Nipples: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.

2.6 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

B. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

C. Soft Copper Tube: ASTM B 88, Types L, water tube, annealed temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2.7 PVC PIPE AND FITTINGS

A. Solid-Wall 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.

2.8 PEX PIPING AND FITTINGS

A. PEX Tubing: ASTM F876 & F877 Grade A.
1. Redbrass Male Threaded Adapter
a. Manufacturers:
1) Uponor Aqua Pex

2.9 SPECIAL PIPE FITTINGS

A. 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. Manufacturers:
a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc.
c. Logan Clay Products Company (The).
d. Mission Rubber Co.
e. NDS, Inc.
f. Plastic Oddities, Inc.
2. 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.

B. 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.
1. Manufacturers:
a. Cascade Waterworks Mfg. Co.
b. Mission Rubber Co.

C. Flexible Ball Joints: Ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include gasketed ball-joint section and ductile-iron gland, rubber gasket, and steel bolts.
1. Manufacturers:
a. EBAA Iron Sales, Inc.

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.
1. Manufacturers:
a. EBAA Iron Sales, Inc.
b. Romac Industries, Inc.
c. Star Pipe Products; Star Fittings Div.

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.
1. Manufacturers:
a. SIGMA Corp.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Specification Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions shall be provided and installed at equipment connections and appurtenances.

B. Indirect drainage piping for equipment connections shall be any of the following:
1. Copper DWV tube, copper drainage fittings, and soldered joints

C. Below-floor (crawl space), condensate drain and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.

3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

D. Above-floor, condensate drain and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.
3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

E. Underground, condensate drain and vent piping shall be any of the following:
1. Extra-Heavy class, cast-iron soil piping, hub and spigot; and gasketed joints.
2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints.
3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

F. Below-floor (crawl space), soil, waste and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; heavy duty, shielded, stainless-steel couplings; and hubless-coupling joints. **(Required for use in Boiler Room, Kitchen and for Greasewaste)**
2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints. **(not permitted in Boiler Room, Kitchen or for Greasewaste)**
3. Copper DWV tube, copper drainage fittings, and soldered joints.
4. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

G. Above-floor, soil, waste and vent piping shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Galvanized steel nipples.
3. Copper DWV tube, copper drainage fittings, and soldered joints.
4. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

H. Underground, soil, waste, vent piping shall be any of the following:
1. Extra-Heavy class, cast-iron soil piping, hub and spigot; and gasketed joints. **(Required for use in Boiler Room, Kitchen and for Greasewaste)**
2. Solid-wall, Schedule 40, PVC pipe; PVC socket fittings; and solvent-cemented joints. **(Not permitted in Boiler Room, Kitchen or for Greasewaste)**
3. Dissimilar Pipe-Material Couplings: Flexible, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

I. Above and below floor (crawl space), trap primer drainage piping shall be any of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.
2. All piping in masonry block wall/chase to be wrapped in 6 mil poly-sleeve.

J. Under-building-slab/in slab, trap primer drainage piping shall be any of the following:
1. Soft copper tube, ASTM B 88, Type L; cast- or wrought- copper brazed-joint fittings; and brazed joints.
2. PEX Tubing: ASTM F877 and F876, NSF Standard 14 and 61; brass fittings; No joints in slab (other than fixture connections).
3. All underslab/in-slab piping to be wrapped in 6 mil poly-sleeve.

K. Acid Waste and Vent Piping: Reference Acid Waste and Vent Piping Specification.

3.3 PIPING INSTALLATION

A. Condensate shall be indirectly discharged into the sanitary drainage system through a 2-inch air gap (into a floor drain or hub drain) and shall not be directly connected (hard piped).

B. Indirect drainage piping shall be discharged into the sanitary drainage system through a 2-inch air gap (into a floor or hub drain) and shall not be directly connected (hard piped).

C. Provide clean outs as indicated on drawings and per local codes.

D. Lead fittings are not acceptable.

E. Sanitary sewer piping outside the building is specified in Specification Section "Sanitary Sewerage."

F. Basic piping installation requirements are specified in Plumbing Specification Section "Basic Plumbing Materials and Methods."

G. 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 Plumbing Specification Section "Basic Plumbing Materials and Methods."

H. Install sleeves for all pipes passing through walls and concrete floors. **Refer to Plumbing Specification Section “Basic Plumbing Materials and Methods” for requirements.**

I. 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." Lead fittings are not acceptable.

J. 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 fixture 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 135 degrees without the installation of a cleanout. 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.

K. 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.

L. 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 all piping.
   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.

M. Install engineered soil and waste drainage and vent piping systems as follows:
   1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by engineer and authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Plumbing Specification Section "Basic Plumbing Materials and Methods."

B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. 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.

D. Solder Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 VALVE INSTALLATION

A. Provide and install backwater valves in sanitary main entering the building where the top of the manhole is at a higher elevation than the finished floor of the first floor.

B. Backwater Valves:
1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
2. Install backwater valves in accessible locations.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties. Contractor is responsible for coordination with all other trades.

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 and larger.
5. Stainless steel flanges required at water fixture drain connection.

3.7 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 engineer and 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 inspections by engineer and authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If engineer or 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 engineer and authorities having jurisdiction.

D. Test sanitary drainage and vent piping as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. **Final Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Contractor shall introduce smoke into piping system continuously until the entire system has been approved by the engineer and the owner's representative.**
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.

3.8 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.

END OF SECTION

SECTION 22 1319

DRAIN PIPING SPECIALTIES

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 sanitary drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.
   3. Roof Drains.
   4. Miscellaneous sanitary drainage piping specialties.
   5. Miscellaneous storm drainage piping specialties.
   6. Solids interceptors.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of concrete bases for outdoor cleanouts.

B. Coordinate size and location of roof penetrations and flashing requirements with architectural.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.

B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.

2.2 CLEANOUTS

A. Exposed Metal Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M for cast iron cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Tyler Pipe; Wade Div.
   d. Watts Drainage Products Inc.
   e. Zurn Plumbing Products Group; Light Commercial Operation.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Spigot.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
14. Standard: ASME A112.3.1.
15. Size: Same as connected branch.

C. Cast-Iron Wall Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure: Countersunk, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

2.3 FLOOR DRAINS

A. Cast-Iron Floor Drains:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on the drawing “Floor Drain Schedule” or a comparable product by one of the following:
a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Light Commercial Operation.
g. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.3.
3. Seepage Flange: Required.
4. Anchor Flange: Required.
5. Outlet: Bottom.
6. Backwater Valve: Not required.
7. Trap Pattern: Standard P-trap, unless otherwise indicated.
8. Other Requirements: Refer to drawing schedule and provide full model equivalency.

2.4 ROOF DRAINS

A. Metal Roof Drains:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group.
2. Standard: ASME A112.21.2M.
3. Pattern: Roof drain.
4. Body Material: Cast iron.
5. Dimensions of Body: Reference Roof Drain Schedule on Drawings.
6. Combination Flashing Ring and Gravel Stop: Required.
7. Flow-Control Weirs: Not required.

8. Outlet: Bottom.
9. Dome Material: Cast iron.
10. 2” Extension Collars: Required for overflow drains only.
11. Underdeck Clamp: Required.
12. Sump Receiver: Required.

B. Metal Combination Roof Drains (Primary and Overflow):
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group.
2. Standard: ASME A112.21.2M.
3. Pattern: Roof drain.
4. Body Material: Cast iron.
5. Dimensions of Body: Reference Roof Drain Schedule on Drawings.
6. Combination Flashing Ring and Gravel Stop: Required.
7. Flow-Control Weirs: Not required.
8. Outlet: Bottom.
9. Dome Material: Cast iron.
10. 2” Extension Collars: Required for overflow drain only, internal.
11. Underdeck Clamp: Required.
12. Sump Receiver: Required.
13. Separate outlets for each drain (two total).

2.5 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies: Refer to architectural drawings and specifications for requirements.

2.6 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Hub Drains:
1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Floor-Drain, Trap-Seal Primer Fittings:
1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Air-Gap Fittings:
1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.7 MISCELLANEOUS STORM DRAIN PIPING SPECIALTIES

A. Downspout Boots:
1. Description: Manufactured, Dura-coated cast iron body, with strap or ears (with last bolt holes) for attaching to building.
2. Size: Inlet size to match downspout; outlet size NPS 4.

B. Downspout Nozzles:
1. Description:
a. Plain, bronze body with threaded inlet and bronze wall flange with mounting holes. (Cast iron conductor)
b. Cast nickel-bronze construction, push on PVC connection, nickel-bronze bolt-on escutcheon and security ring (PVC conductor).
2. Size: Same as connected conductor.

2.8 SOLIDS INTERCEPTORS

A. Solids Interceptors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings “Plumbing Fixture Schedule” or a comparable product by one of the following:
a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Type: Factory-fabricated interceptor made for removing and retaining sediment from wastewater.
3. Body Material: Cast iron or steel.
4. Interior Lining: Corrosion-resistant enamel.
5. Exterior Coating: Corrosion-resistant enamel.
6. End Connections: Threaded.
7. Other Requirements: Refer to drawing schedule and provide full model equivalency.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Plumbing Specification Section "Basic Plumbing Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Provide and install cleanouts (in addition to those indicated on the drawings) in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 135 degrees.
3. Locate at maximum intervals of 50 feet for piping.
4. Locate at base of each vertical soil and waste stack.
5. Locate one cleanout for each restroom.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame anchored to reinforcement or studs and cover flush with finished wall.

E. 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 architectural requirements.
   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.

F. Install roof flashing assemblies on roof drains, sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Assemble open drain fittings and install with top of hub 2 inches above floor.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
   1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
   2. Size: Same as floor drain inlet.
   3. Connection to floor drain body is not acceptable.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.

L. Install reinforcement for wall-mounting-type specialties.

M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Plumbing Specification Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Refer to architectural roofing drawings and specifications for requirements.

B. Install flashing for piping passing through roofs with counter-flashing or commercially made flashing fittings, according to Specification Section "Sheet Metal Flashing and Trim."

C. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

D. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 1940

FUEL GAS 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 fuel gas piping within the building. Products include the following:
1. Pipe, tube, fittings, and joining materials.
2. Protective pipe and fitting coating.
3. Piping specialties.
4. Specialty valves.
5. Joining materials.
6. Pressure regulators.

B. Related Sections include the following: Division 2 Section “Natural Gas Distribution” for natural gas service piping, specialties, and accessories outside the building.

1.3 PROJECT CONDITIONS

A. Gas System Pressure: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2.0 psig, and is reduced to secondary pressure of 0.5 psig or less.

B. Design values of fuel gas supplied for these systems are as follows:
1. Normal Heating Value: 1000 Btu/cu. ft.
2. Nominal Specific Gravity: 0.6.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Pipes, tubes, fittings, and joining materials.
2. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Pressure regulators. Include pressure rating, capacity, and settings of selected models.

B. Welding certificates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For natural gas specialties and accessories to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Quality processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Electrical Components and Devices: 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. NFPA Standard: Comply with NFPA 54, "National Fuel Gas Code."

1.6 COORDINATION

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others u unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

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 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Steel Pipe: ASTM A 53/A 53M; Type E or S; Grade B; black. Wall thickness of wrought-steel pipe shall comply with ASME B36.10M.
   1. Malleable-Iron Threaded Fittings: ASME B 16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
   2. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
   3. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
   4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint and threaded ends according to ASME B1.20.1.
   5. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
   6. Joint Compound and Tape: Suitable for natural gas.
   7. Steel Flanges and Flanged Fittings: ASME B16.5.
   8. Gasket Material: Thickness, material and type suitable for natural gas.

B. PE Pipe: ASTM D 2513, SDR 11.
   1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
   2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
   3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
      a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.

b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering.
c. Aboveground Portion: PE transition fitting.
d. Outlet shall be threaded or suitable for welded connection.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated and leak tested.
a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
b. Outlet shall be threaded or suitable for welded connection.
c. Bridging sleeve over mechanical coupling.
d. Factory-connected anode.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.4 SPECIALTY VALVES

A. Valves, NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

B. Valves, NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

C. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig minimum pressure rating.

D. Gas Valves, NPS 2 and Smaller: ASME B16.33 and CSA International-listed bronze body and 125-psig pressure rating.
1. Manufacturers:
a. BMI Canada, Inc.
b. Crane Valves
c. Dungs, Karl, Inc.
d. Flow Control Equipment, Inc.
e. Grinnel Corp.
f. Honeywell International Ltd.
g. KITZ Corporation
h. Legend Valve and Fitting, Inc.
i. Lyall, R.W. & Co.., Inc.
j. McDonald, A.Y. Mfg. Co.
k. Milwaukee Valve Company
l. Mueller Co.; Mueller Gas Products Div.
m. NIBCO INC.
n. Red-White Valve Corp.
o. Velan Inc.
p. Watts Industries, Inc.; Water products Div.
2. Temperproof Feature: Include design for locking.

E. Plug Valves, NPS 2-1/2 and larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125-psig pressure rating.
1. Manufacturers:
a. Flow Control Equipment, Inc.

b. Milliken Valve Co., Inc.
c. Nordstrom Valves, Inc.
d. Olson Technologies, Inc.; Homestead Valve Div.
e. Walworth Co.

2. Tamperproof Feature: Include design for locking.

F. General-Duty Valves, NPS 2-1/2 and Larger: ASME B16.38, cast-iron body, suitable for fuel gas service, with “WOG” indicated on valve body, and 126-psig pressure rating.
1. Gate Valves: MSS SP-70, OS&& type with solid wedge.
2. Butterfly Valves: MSS SP-67, lug type with lever handle.

G. Automatic Gas Valves: ANSI Z21.21, with electrical or mechanical operator for actuation by appliance automatic shutoff device.
1. Manufacturers:
a. ASCO General Controls.
b. ASCO Power Technologies, LP; Division of Emerson
c. ASCO Valve Canada, Division of Emerson Electric Canada Limited.
d. Dungs, Karl, Inc.
e. Eaton Corporation; Controls Div.
f. Eclipse Combustion, Inc.
g. GPS Gas Protection Systems, Inc.
h. Honeywell International Inc.
i. Johnson Controls

2.5 PIPING SPECIALTIES

A. Appliance Flexible Connectors:
1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches (1830 mm).

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:
1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.6 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.7 PRESSURE REGULATORS

A. General Requirements:
1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Actaris.
   b. American Meter Company.
   c. Eclipse Combustion, Inc.
   d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
   e. Invensys.
   f. Maxitrol Company.
   g. Richards Industries; Jordan Valve Div.
3. Body and Diaphragm Case: Cast iron or die-cast aluminum.
4. Springs: Zinc-plated steel; interchangeable.
5. Diaphragm Plate: Zinc-plated steel.
6. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
7. Orifice: Aluminum; interchangeable.
8. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
9. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
10. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
11. Overpressure Protection Device: Factory mounted on pressure regulator.
12. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
13. Maximum Inlet Pressure: 2 psig.

2.8 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core

encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

3.2 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 2 Section "Earthwork" for excavating, trenching, and backfilling.
   1. If natural-gas piping is installed less than 36 inches (900 mm) below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:
   1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
   2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
   3. Replace pipe having damaged PE coating with new pipe.

E. Copper Tubing with Protective Coating:
   1. Apply joint cover kits over tubing to cover, seal, and protect joints.
   2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

F. Install fittings for changes in direction and branch connections.

G. Exterior-Wall Pipe Penetrations: Seal penetrations using steel or 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.

H. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

I. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Section "Meters and Gages."

3.3 INDOOR PIPING APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Fuel Gas Piping, 2 psig or Less:
   1. NPS 1/2 and Smaller: NPS 3/4 steel pipe, malleable-iron threaded fittings, and threaded joint. No fuel gas piping shall be smaller than NPS 3/4; provide reducers at equipment where required.
   2. NPS 3/4 and NPS 1: Steel pipe, malleable-iron threaded fittings, and threaded joints.
   3. NPS 1-1/4 to NPS 2: Steel pipe, malleable-iron threaded fittings, and threaded joints.
   4. NPS 2-1/2 and Larger: Steel pipe, steel welding fittings, and welded joints.

3.4 VALVE APPLICATIONS

A. Piping Line Valves, NPS 2 and Smaller: Gas valve.

B. Piping Line Valves, NPS 2-1/2 and Larger: Plug valve or general-duty valve.

3.5 PIPING INSTALLATION

A. Basic piping installation requirements and piping joint construction are specified in Specification Section "Basic Mechanical Materials and Methods."

B. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.
   1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

C. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors and in floor channels, unless indicated to be exposed to view.

D. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

E. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

F. Connect branch piping from top or side of horizontal piping.

G. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

H. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

I. Install pressure gage upstream and downstream from each line pressure regulator. Pressure gages are specified in Specification Section "Meters and Gauges."

J. Install flanges on valves, specialties, and equipment having NPS 2-1/2 and larger connections.

K. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

L. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect in large end. Prepare

and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

3.6 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in Specification Section “Basic Mechanical Materials and Methods.”

B. Use materials suitable for fuel gas.
   1. Brazed Joints: make with brazing alloy with melting point greater than 1000 deg. F. Brazing alloys containing phosphorus are prohibited.

C. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.7 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support and equipment support materials and installation requirements are specified in Specification Section "Hangers and Supports."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
   1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
   2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
   3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
   4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
   5. NPS 4 and larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

E. Ground equipment according to Specification Section “Grounding and Bonding.”
   1. Do not use gas pipe as grounding electrode.

F. Connect wiring according to Specification Section “Conductors and Cables.”

3.9 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate for sign on or near each service meter, pressure regulator, and specialty valve.
   1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
   2. Nameplates, pipe identification, and signs are specified in Specification Section “Mechanical Identification.”

3.10 PAINTING

A. Use materials and procedures in painting specification Sections.

B. Paint exterior piping (including rooftop applications).
   1. Color: Yellow

3.11 FIELD QUALITY CONTROL

A. Test, inspect, and purge piping according to NFPA 54 and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

D. Verify correct pressure settings for pressure regulators.

E. Verify that specified piping tests are complete.

END OF SECTION

SECTION 22 3300

ELECTRIC WATER HEATERS

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 electric water heaters:
   1. Commercial, storage electric water heaters.
   2. Compression expansion tanks.
   3. Water heater accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories. Submitted product to match specified/scheduled equipment including all options and appurtenances, in addition to specifications.

B. Specification Compliance Review:
   1. Manufacturers and bidders must provide the consulting engineer with a Compliance Review of the Specifications and Addenda's. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications and schedule with the following information; "C", "D", or "E" marked in the margin of the original Specifications and any subsequent Addenda's. If the manufacturer or bidder does not provide the Compliance Review to the engineer for review, with the submittal, the submittal will be subject to rejection as non-compliant.
      a. "C" Comply with no exceptions.
      b. "D" Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
      c. "E" Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives. Non-compliance with the specifications is grounds for rejection as unacceptable. A bid from any alternative or listed equipment manufacturer with any number of exceptions will be reason for rejection for non-compliance without further review.
      d. Unless a deviation or exception is specifically noted in the Compliance Review, the manufacturer shall provide full compliance with entire specification. Deviations or exceptions taken in letters or cover letters in a bid document, subsidiary documents, by omission or by contradiction do not release the manufacturer or bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review and approved by the consulting engineer.
      e. Equipment manufacturers or bidders that do not meet the specifications thru the above process will be subject to rejection without further review.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Product Certificates: For each type of commercial electric water heater, signed by product manufacturer.
   1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Source quality-control test reports.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

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: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

F. Origin of product to be domestic, no imported products will be acceptable.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. Warranty Period(s): From date of Substantial Completion:

a. Commercial Electric Water Heaters:
   1) Storage Tank: Six (6) years.
   2) Controls and Other Components: Three (3) years.

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 COMMERCIAL ELECTRIC WATER HEATERS (2.5 THROUGH 30 GALLON)

A. Commercial Storage Electric Water Heaters: Comply with UL 174 requirements for storage-tank-type water heaters.
   1. Manufacturers:
      a. Rheem Water Heater Div.; Rheem Manufacturing Company.
      b. Smith, A.O. Water Products Company.
   2. Storage-Tank Construction: steel vertical arrangement.
      a. Tappings: ½" NPT (2.5 Gallon tank) or ¾" NPT (6 through 30 Gallon) factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
      b. Pressure Rating: 150 psig.
      c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings; high temperature porcelain enamel.
      d. ASME rated tank per ASME Boiler and Pressure Vessel Code, Section IV Part HLW if specified on schedule.
   3. Factory-Installed Storage-Tank Appurtenances:
      a. Anode Rod: Replaceable magnesium.
      b. Drain Valve: ¾", ¼ turn bronze ball valve, stainless steel ball and trim. ¾" hose thread adaptor and cap.
      c. Insulation: Comply with ASHRAE/IESNA 90.1; 2-½" rigid polyurethane foam insulation, non-CFC.
      d. Jacket: Steel with enameled finish.
      e. Heating Elements: Electric, screw-in immersion type arranged in multiples of three; stainless steel.
         1) Staging: Input not exceeding 18 kW per step.
      f. Temperature control: Adjustable thermostat, surface mounted.
      g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
      h. Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3, for combination temperature and pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating on top of tank. Select one relief valve with sensing element that extends into storage tank.
   4. Special Requirements: NSF 5 construction.
   5. Capacity and Characteristics: Refer to drawing schedule.

2.3 COMMERCIAL ELECTRIC WATER HEATERS (50 THROUGH 120 GALLON)

A. Commercial, Storage Electric Water Heaters: Comply with UL 1453 requirements for storage-tank-type water heaters.
   1. Manufacturers:
      a. Rheem Water Heater Div.; Rheem Manufacturing Company.
      b. Smith, A. O. Water Products Company.
   2. Storage-Tank Construction: steel vertical arrangement.
      a. Tappings: 1-½" NPT factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
      b. Pressure Rating: 150 psig.
      c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings; high temperature porcelain enamel.
      d. ASME rated tank per ASME Boiler and Pressure Vessel Code, Section IV Part HLW if specified on schedule.
   3. Factory-Installed Storage-Tank Appurtenances:
      a. Anode Rod: Replaceable magnesium; two (2) anodes per tank.
      b. Drain Valve: ¾", ¼ turn bronze ball valve, stainless steel ball and trim. ¾" hose thread adaptor and cap.
      c. Insulation: Comply with ASHRAE/IESNA 90.1; 3" rigid polyurethane foam insulation, non-CFC.
      d. Jacket: Steel with enameled finish.
      e. Heating Elements: Electric, screw-in immersion type; stainless steel. Minimum of two (2) elements.
         1) Staging: Input not exceeding 18 kW per step.
      f. Temperature Control: Adjustable thermostat. (Non-ASME: Surface mounted, ASME: Immersion type)
      g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
      h. Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3, for combination temperature and pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
   4. Special Requirements: NSF 5 construction.
   5. Capacity and Characteristics: Refer to drawing schedule.

2.4 COMPRESSION EXPANSION TANKS

A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system-operating pressure at tank.
   1. Manufacturers:
      a. Smith, A. O.; Aqua-Air Div.
      b. Rheem Water Heater Div.
   2. Construction:
      a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
      b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
      c. Air-Charging Valve: Factory installed.
   3. Capacity and Characteristics:
      a. Working-Pressure Rating: 150 psig.
      b. Capacity Acceptable: Refer to drawings.

c. Air Precharge Pressure: Refer to drawings**.**

2.5 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than water heater working-pressure rating.

C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.

D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

E. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig maximum outlet pressure, unless otherwise indicated.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial water heater storage tanks before shipment to minimum of one and one-half times pressure rating.

C. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.
1. Concrete base construction requirements are specified in Specification Section "Basic Plumbing Materials and Methods."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Extend commercial-water-heater relief-valve outlet, with drain piping of same material as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains with drain piping of same material as domestic water piping.

E. Install thermometer on outlet piping of water heaters. Refer to Specification Section "Meters and Gauges" for thermometers.

F. Install pressure gage(s) on outlet of commercial electric water- heater piping. Refer to Specification Section "Meters and Gauges" for pressure gages.

G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

H. Fill water heaters with water.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other plumbing and mechanical Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install water heater and piping adjacent to heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Specification Section "Grounding and Bonding."

D. Connect wiring according to Specification Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 1 Section "Closeout Procedures” or “Demonstration and Training.”

END OF SECTION

SECTION 22 4100

PLUMBING FIXTURES

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 conventional plumbing fixtures and related components:
1. Faucets for lavatories.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Dishwasher air-gap fittings.
7. Disposers.
8. Water closets.
9. Urinals.
10. Lavatories.
11. Commercial sinks.
12. Kitchen sinks.
13. Service basins.
14. Utility Boxes

B. Related Sections include the following:
1. Specification Section "Water Distribution" for exterior plumbing fixtures and hydrants.
2. Specification Section "Toilet and Bath Accessories."
3. Specification Section "Emergency Plumbing Fixtures."
4. Specification Section "Security Plumbing Fixtures."
5. Specification Section "Drinking Fountains and Water Coolers."
6. Specification Section "Plumbing Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities; and is compliant with the Texas Accessibility Standards (TAS), Article 9102, Texas Civil Statutes.

B. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
   1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

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. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act" for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in the Texas Accessibility Standards (TAS), Architectural Barriers Act, Article 9102, Texas Civil Statutes.

E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
   1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
   2. Water-Closet, Flushometer Tank Trim: ASSE 1037.

I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
   1. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
   2. Faucets: ASME A112.18.1.
   3. Hose-Connection Vacuum Breakers: ASSE 1011.
   4. Hose-Coupling Threads: ASME B1.20.7.
   5. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
   6. NSF Potable-Water Materials: NSF 61.
   7. Pipe Threads: ASME B1.20.1.
   8. Supply Fittings: ASME A112.18.1.
   9. Brass Waste Fittings: ASME A112.18.2.

J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
   1. Atmospheric Vacuum Breakers: ASSE 1001.
   2. Brass and Copper Supplies: ASME A112.18.1.
   3. Dishwasher Air-Gap Fittings: ASSE 1021.
   4. Manual-Operation Flushometers: ASSE 1037.
   5. Plastic Tubular Fittings: ASTM F 409.
   6. Brass Waste Fittings: ASME A112.18.2.

K. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Disposers: ASSE 1008 and UL 430.
   2. Dishwasher Air-Gap Fittings: ASSE 1021.
   3. Flexible Water Connectors: ASME A112.18.6.
   4. Hose-Coupling Threads: ASME B1.20.7.
   5. Off-Floor Fixture Supports: ASME A112.6.1M.
   6. Pipe Threads: ASME B1.20.1.
   7. Plastic Toilet Seats: ANSI Z124.5.
   8. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

A. Warranty Period: Two (2) years from dated of Substantial Completion.

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. Faucet Cartridge, Assembly and Associated O-Rings: Equal to 2 or 5 percent of amount of each type and size installed (whichever is greater).
   2. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 12 of each type.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Product descriptions hereinafter represent minimum requirements for each fixture; refer to Basis-of-Design manufacturer and model number listed on the drawing “Plumbing Fixture Schedule” for additional features, construction details, accessories and/or options.

2.2 MATERIALS AND WORKMANSHIP

A. All materials, unless otherwise specified, shall be 51% manufactured in the United States, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner’s Representative prior to bidding may be furnished.

B. Materials and equipment shall be installed in accordance with the manufacturer’s recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.

2.3 STOPS

A. Angle Stops:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (unless noted otherwise on drawings or on schedule).
a. Chicago Faucets.
b. McGuire Manufacturing Co., Inc.
c. T & S Brass and Bronze Works, Inc.
2. Description: Heavy duty cast brass with compression cartridge.
a. Finish: Chrome plated.
b. Stem: Brass, full turn.
c. Operation: Loose Key, unless otherwise indicated.
d. Outlet: NPS 3/8, compression
e. Inlet Size: NPS 1/2, female thread.

2.4 LAVATORY FAUCETS

A. Lavatory Faucets, Manual:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed on the drawing “Plumbing Fixture Schedule” or a comparable product by one of the following: (unless noted otherwise on drawings or within Schedule)
a. Chicago Faucets.
b. T & S Brass and Bronze Works, Inc.
c. Kohler
2. Description: Two-handle mixing valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
a. Body Material: Commercial, solid brass.
b. Finish: Polished chrome plate.
c. Maximum Flow Rate: 0.5 gpm. (unless noted otherwise on drawings or within Schedule)
d. Valve Handle(s): Wrist blade, 4 inches.
e. Spout Outlet: Aerator.
f. Operation/Cartridge: Ceramic disk, manual.

2.5 SINK FAUCETS

A. Sink Faucets, Manual, Single Hole:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed on the drawing “Plumbing Fixture Schedule” or a comparable product by one of the following: (unless noted otherwise on drawings or within Schedule)
a. Chicago Faucets.
b. T & S Brass and Bronze Works, Inc.
c. Kohler
d. Elkay
2. Description: One or two-handle valve. Include cold and hot-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
a. Body Material: Commercial, solid brass.
b. Finish: Polished chrome plate.
c. Maximum Flow Rate: 2.2 gpm, (unless noted otherwise on drawings or within Scheduled)
d. Mixing Valve: None.

e. Handle: Wrist blade, 4 inches; coordinate single handle (CW only) units with floor plans such that lever is always located on front side of counter/sink.
f. Spout Outlet: Aerator.
g. Operation: Compression, manual.

2.6 TOILET SEATS

A. Toilet Seats:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. American Standard Companies, Inc.
b. Bemis Manufacturing Company.
c. Church Seats.
d. Kohler Co.
2. Description: Toilet seat for water-closet-type fixture.
a. Material: Molded, solid plastic.
b. Configuration: Open front without cover.
c. Size: Elongated.
d. Hinge Type: SC, self-sustaining, check.
e. Class: Heavy-duty commercial.
f. Color: White.

2.7 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (unless noted otherwise on drawings or within Schedule)
a. McGuire Manufacturing Co., Inc.
b. TRUEBRO, Inc.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

2.8 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Lavatory Supports:
1. Description: Type II, manufactured lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet. Factory painted.
2. Accessible-Fixture Support: Include rectangular steel uprights.

C. Securements
1. Stainless Steel drop in anchors with heavy-duty class stainless steel bolts. All-threaded is not acceptable.

2.9 DISHWASHER AIR-GAP FITTINGS

A. Dishwasher Air-Gap Fittings:
   1. Manufacturers: Subject to compliance with requirements, provide product (or provide Dishwasher loop where local jurisdiction allows):
      a. Watts Brass & Tubular; a division of Watts Regulator Co.
   2. Description: 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; and inlet pressure of at least 5 psig at a temperature of at least 140 deg F. Include 5/8-inch ID inlet and 7/8-inch ID outlet hose connections.
   3. Hoses: Rubber and suitable for temperature of at least 140 deg F.
      a. Inlet Hose: 5/8-inch ID and 48 inches long.
      b. Outlet Hose: 7/8-inch ID and 48 inches long.

2.10 DISPOSERS

A. Disposers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (unless noted otherwise on drawings or within Schedule).
      a. In-Sink-Erator; a div. of Emerson Electric Co.
      b. KitchenAid.
   2. Description: Batch-feed household, food-waste disposer. Include reset button; switch; corrosion-resistant chamber with jam-resistant, cutlery- or stainless-steel grinder or shredder; NPS 1-1/2 outlet; quick-mounting, stainless-steel sink flange; antisplash guard; and combination cover/stopper.
      a. Type: Batch-feed household.
      b. Model: Sound-insulated chamber.
      c. Motor: 115-V ac.
      d. Minimum 1/2 HP motor

2.11 WATER CLOSETS

A. Water Closets, Floor Mounted, ADA-Compliant:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed on the drawing “Plumbing Fixture Schedule” or a comparable product by one of the following: (unless noted otherwise on drawings or within Schedule)
      a. American Standard Companies, Inc.
      b. Kohler Co.
   2. Description: Accessible, floor-mounting, floor-outlet, vitreous-china fixture designed for flush tank operation.
      a. Style: Two piece.
         1) Bowl Type: Elongated with siphon-jet design; include bolt caps matching fixture.
         2) Design Consumption: 1.28 gal./flush (unless noted otherwise on drawings or within Schedule).
         3) Color: White.
         4) Toilet Seat: Required; see other paragraph.
         5) Flush tank.

2.12 LAVATORIES

A. Lavatories:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed on the drawing “Plumbing Fixture Schedule” or a comparable product by one of the following: (unless noted otherwise on drawings or within Schedule).
   a. American Standard Companies, Inc.
   b. Kohler Co.
2. Description: Accessible, wall-mounting, vitreous-china fixture.
   a. Type: With back Ledge back Shelf back Slab Pedestal.
   b. Faucet Hole Punching: Coordinate with faucet.
   c. Color: White.
   d. Supplies: NPS 3/8 chrome-plated copper with stops.
   e. Drain: Grid.
   f. Drain Piping: NPS 1-1/4 chrome-plated, cast-brass 17-ga. P-trap; NPS 1-1/4 0.045-inch thick tubular brass waste to wall (trap arm); and wall escutcheon.

2.13 COMMERCIAL SINKS

A. Commercial Sinks:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed on the drawing “Plumbing Fixture Schedule” or a comparable product by one of the following: (unless noted otherwise on drawings or within Schedule).
   a. Elkay Manufacturing Co.
   b. Just Manufacturing Company.
2. Description: Counter-mounting/under mounting (per drawings), seamless commercial sink, self-rimming, fully undercoated for sound attenuation, with 1-3/4” radius coved corners.
   a. Metal: 304 stainless steel, 18 gauge.
   b. Finish: Satin.
   c. Drain: 3” Grid, chrome-plated brass, with vandal resistant strainer and NPS 1-1/2 tailpiece; unless otherwise indicated.
   d. Supplies: NPS 1/2 chrome-plated copper with stops.
   e. Drain Piping: NPS 1-1/2 chrome-plated, cast-brass P-trap; 0.045-inch- thick tubular brass waste to wall (trap arm); and wall escutcheon(s).

2.14 SERVICE BASINS

A. Service Basins:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed on the drawing “Plumbing Fixture Schedule” or a comparable product by one of the following: (unless noted otherwise on drawings or within Schedule).
   a. Crane Plumbing, L.L.C./Fiat Products.
   b. Stern-Williams Co., Inc.
2. Description: Flush-to-wall, floor-mounting, pre-cast terrazzo fixture with rim guard.
   a. Rim Guard: On front surfaces, stainless steel.
   b. Faucet: As indicated on drawing “Plumbing Fixture Schedule.”
   c. Color: Not applicable.
   d. Drain: Cast-brass with nickel-bronze grid and NPS 3 (DN 80) outlet; extra heavy-duty, cast iron, deep seal trap.

2.15 UTILITY BOXES

A. Utility Boxes, Clothes Washer:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed on the drawing “Plumbing Fixture Schedule.”
2. Description: Flush mounted in wall cavity with shutoff valves.

a. Material: Galvanized Steel.
b. Finish: Unpainted.
c. Valves: Bronze, brass stem, compression.
d. Outlets: 3/4" Hose Thread.
e. Inlet Size: NPS 1/2, female thread.
f. Supplies: 60-inch Heavy-duty CW and HW clothes washer hoses, manufactured by Floodcheck (no exceptions). Provide with shock arrestors equal to Precision Plumbing Products #WHA-500L.

B. Utility Boxes, Ice Maker:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product listed on the drawing “Plumbing Fixture Schedule.”
2. Description: Flush mounted in wall cavity with angle stop.
a. Material: Galvanized Steel.
b. Finish: Unpainted.
c. Supply: Annealed copper tube, minimum 48-inch length (coiled) to permit pulling out appliance for rear service.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. All wall mounted fixtures and equipment shall be installed with floor mounted carriers (Manufacturer provided).

D. Install wall-mounted fixtures AT ELEVATIONS INDICATED ON ARCHITECTURAL DRAWINGS.

E. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

F. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

G. Install wall-mounting fixtures with tubular waste piping attached to supports.

H. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

I. Install counter-mounting fixtures in and attached to casework.

J. Install fixtures level and plumb according to roughing-in drawings.

K. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
   1. Exception: Use ball, if supply stops are not specified with fixture. Valves are specified in Specification Section "Valves."

L. All appurtances supporting fixtures to be chrome plated in exposed areas (including but not limited to under cabinet areas).

M. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

N. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

O. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

P. Install toilet seats on water closets.

Q. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

S. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

T. Install shower flow-control fittings with specified maximum flow rates in shower arms.

U. Install traps on fixture outlets.
   1. Exception: Omit trap on fixtures with integral traps.
   2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

V. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

W. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Install on countertop at sink. Connect inlet hose to dishwasher and outlet hose to disposer.

X. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Specification Section "Basic Mechanical Materials and Methods."

Y. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Specification Section "Joint Sealants."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other plumbing specification sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures and appliances with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Specification Section "Grounding and Bonding."

D. Connect wiring according to Specification Section "Conductors and Cables."

E. Arrange for electric-power connections to fixtures, transformers and devices that require power. Electric power is specified in Electrical Specification Sections.

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

F. Run hot water (full flow) at each faucet until temperature is stable (-2 degree deviation from water heater set point); balance manual (y-type, etcetera) mixing valve at each faucet to 110 F spout-discharge temperature.

G. After compression cartridges are well-seated (50-60 cycles), adjust faucet wrist-blade handles to position parallel to back-splash (or wall that lavatory is mounted to) when fully closed (tight).

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 0005

MECHANICAL DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner cleaned, packaged, and ready for reuse.

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

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

1.3 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
   1. Coordinate with Owner's representative, who will establish special procedures for removal and salvage.

1.4 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services (including but not limited to: Gas, Water, Fire Suppression, Chilled Water, Hot Water, Air Conditioning, etc).
   4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
   5. Means of protection for items to remain and items in path of waste removal from building.

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

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Section “Project Management and Coordination.” Review methods and procedures related to selective demolition including, but not limited to, the following:
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 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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

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

D. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

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

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

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

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

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

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

B. Service/ Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
      a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

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.

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. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
   3. Maintain adequate ventilation when using cutting torches.
   4. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. 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.

E. Contractor shall terminate demolished pipe and/or ductwork. System shall be capped and insulated per new work specification.

F. Contractor shall remove any abandoned piping and/or ductwork in area of construction during the demolition process.

G. Unforeseen Conditions
1. Any unforeseen utilities found during construction that directly affect any trade must be brought to the engineer’s attention via RFI.
2. All existing conditions must be clearly annotated on the As-Built drawings.

H. Repair any walls, floors or roofs that piping, ducts or equipment have been removed from (or through). Patch with similar materials to match finish and color (paint to match). If paint cannot be matched, repaint entire wall or surface.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them 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.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 23 0100

SPECIAL CONDITIONS FOR ALL MECHANICAL WORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section covers the general provisions of the mechanical specifications applicable to the following systems:
   1. Heating, air conditioning, and ventilation.

B. The use of the word mechanical in the body of the various specifications sections shall be interpreted to include all the aspects of all of the systems referenced in Mechanical Specifications.

1.2 DRAWINGS

A. These specifications are accompanied by drawings of the building and details of the installations showing the locations of equipment, piping, ductwork, etc. The drawings and these specifications are complementary to each other; requirements described in one or the other shall be considered binding as if described in both.

B. If any departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Owner's Representative for approval. No departures shall be made without prior written approval by the Owner's Representative.

C. There are intricacies of construction which are impractical to specify or indicate in detail; means and methods for performing such work shall adhere to commonly accepted industry standards.

D. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical, and Electrical drawings and applicable shop drawings where such information affects his work.

E. For new buildings, all final dimensions shall be scaled from the Architectural drawings, unless otherwise noted. For work associated with existing buildings (renovations and additions), all final dimensions shall be field verified.

1.3 CONSTRUCTION REQUIREMENTS

A. The architectural, civil, structural, electrical, plumbing, fire protection and mechanical drawings, and specifications are all part of the Contract Documents. In many instances there are details described on another trade's drawings that are not necessarily included or referenced in the mechanical drawings. It is the Contractor's responsibility to review in detail all parts of the Contract Documents prior to submitting a bid. Failure to comply with this requirement shall not relieve the Contractor of responsibility or be used as cause for additional compensation because architectural, structural, or electrical details were not included in the mechanical drawings.

B. It is the intent of the Contract Documents to provide complete and fully functional installation in every respect. Material and/or construction details not specifically described in the Contract Documents, but commonly considered incidental to the industry, are required by the Contractor.

C. The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to comply with Codes, to facilitate the work of other trades, to conform to the details of the installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated satisfactory operating installation.

D. The mechanical, electrical and plumbing drawings are schematic in nature and do not show every connection in detail or every pipe or conduit in its exact location. These details are subject to the requirements of ordinances and structural and architectural conditions.

E. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and above suspended ceilings, etc. in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid compromising structural members; therefore, inserts to accommodate hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc. shall be provided as hereinafter specified or as otherwise indicated or required. All work shall be installed parallel or perpendicular to building lines unless otherwise noted.

F. When the mechanical drawings do not give exact details as to the elevation of pipe or ducts, physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Piping, exposed conduit, and duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The plans do not show all required offsets, control lines, pilot lines, and other location details. Work shall be concealed in all finished areas. Piping specified to be insulated shall be supported in a manner that will allow the insulation to be installed without gaps. Insulated piping in concealed areas shall be offset with fittings as necessary to permit installation of insulation. Bending of pipes or installing pipes in a strain to insulate will not be permitted.

G. Final placement of serviceable equipment shall be carefully coordinated with all other trades to ensure sufficient clearance for maintenance according to manufacturer’s recommendations. Lubricating orifices and adjustable components shall be easily accessible. Piping, conduit, valve stems, cabling and other building systems shall not interfere with service space.

H. Location of Exposed Devices
   1. All exposed devices (grills, registers, diffusers, sprinkler heads, medical gas outlets, plumbing rough-ins, lights, outlets, communication devices, etcetera) shall be referenced to fixed data points that are coordinated with all trades; shall be located to present symmetrical arrangements with respect to the fixed data point; and shall facilitate the proper arrangements of acoustical ceiling tiles. Fixed data points shall include such features as wall and ceiling lines, soffits, balanced border widths, masonry joints, etc. Devices located in acoustical ceiling tiles shall occur symmetrically in tile joints or in the centers of whole tiles. The final determination of the exact location of each outlet and the arrangements to be followed shall be acceptable to the Owner’s Representative.
   2. The drawings schematically indicate locations of the exposed devices. Final locations shall be determined by carefully coordinating the drawings pertaining to each trade. Where conflicts are identified, Owner’s Representative shall determine final location. The Owner reserves the right to make any reasonable change in location of any device before installation, without additional cost.

1.4 QUALIFICATIONS

A. Contractor must have minimum of five years experience installing commercial heating, ventilation and air conditioning systems, plumbing and piping systems similar to those described in these Contract Documents.

B. Contractor must be licensed and hold a current contracting license that has been valid for a minimum of five years in the State of Texas.

C. Contractor must be able to bond work for payment and performance of work being bid. Contractor's bonding agency shall have a Best's insurance rating of A or A+.

1.5 MATERIAL AND EQUIPMENT REQUIREMENTS

A. Manufacturer's Instructions: The manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufacturer materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Owner's Representative in writing of any conflict between the requirements of the Contract Documents and the manufacturer's direction and shall obtain the clarification of the Owner's Representative before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such clarification by the Owner's Representative, he shall bear all costs arising in connection with the correction of the deficiencies.

B. Storage at Site: The Contractor shall not receive material or equipment at the jobsite until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage and from surrounding work.

C. Capacities shall be not less than those indicated and shall be such that no component or system becomes inoperative or is damaged because of startup or other overload conditions.

D. Conformance to Agency Requirements: Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriters Laboratories, Inc., ETL listed or constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers or the Air Moving and Conditioning Association, the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of the Underwriters Laboratories, Inc. or ETL applied to the item will be acceptable as sufficient evidence that the items conform to such requirements. The ASME stamp or the AMCA label will be acceptable as sufficient evidence that the items conform to the respective requirements.

E. Nameplates: Each major component of equipment shall have the manufacturer's name, address, and model-identification number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Inspection.

F. Prevention of Rust: Standard factory finish will be acceptable on equipment specified by model number otherwise surfaces of ferrous metal shall be given a rust-inhibiting coating. The treatment shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking and no signs of rust creepage beyond 1/8 inch on either side of the scratch mark. Where rust inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable unless a specific coating is specified, except that coal tar or asphalt-type coatings will not be acceptable unless so stated for a specific item. Where steel is specified to be hot-dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-26915.

G. Protection from Moving Parts: Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.

H. Drive Guards: For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears, and other moving parts regardless of height above the floor. Drive guards may be excluded where motors and drives are inside factory-

fabricated air handling units casings. Guards shall be constructed of sheet steel, cast iron, expanded metal, or wire mesh rigidly secured so as to be removable without disassembling pipe duct or electrical connection to equipment. Provide a 1-inch diameter hole in each drive guard at each shaft center to allow access for speed measurement.

I. Verifications of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Owner's Representative of any discrepancy before performing any work. Adjustments to the work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner, Architect, or Engineer.

J. Standard Products: Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

K. Spare Parts Data: As soon as practicable after approval of materials and equipment and, if possible, not later than four months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies with current unit prices and sources of supply, a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the Contract, and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation. The foregoing shall not relieve the Contractor of any responsibilities under the warranty specified.

1.6 INSPECTION OF THE SITE

A. The Contractor shall visit the site, verifying all existing items indicated on drawings and/or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil conditions, structures, utilities, equipment, systems, facilities, and local requirements. The submission of bids shall be deemed evidence of such visits. All proposals shall take these existing conditions into consideration, and the lack of specific information shall not relieve the Contractor of any responsibility.

1.7 UTILITY LOCATIONS AND ELEVATIONS

A. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered separately from the Contract Documents, as a general guide only, without guarantee as to accuracy. Examine the site, the locations, and availability of all utilities and services required for their relation to the work. Verify the location of all existing site utilities with each responsible utility company or applicable party. The Contractor shall repair all damage to existing utilities, whether indicated on the drawings or not, at his sole expense.

1.8 PERMITS, UTILITY CONNECTIONS, AND INSPECTIONS

A. Permitting Fees: Contractor shall pay for all fees associated with permits required by municipal authorities having jurisdiction.

B. Tapping and Impact Fees: Contractor shall pay for all fees associated with tapping into municipal utility mains, including sanitary sewer, natural gas and domestic water. Impact fees will be paid for by the Owner.

C. Compliance: The Contractor shall comply in every respect with all requirements of local authorities having jurisdiction, including building inspections, fire marshal, local ordinances and codes, and utility company requirements. In no case does this relieve the Contractor of the responsibility of complying with these specifications and drawings where specified conditions are of a higher quality than the requirements of the above-specified authorities. Where requirements of the specifications and drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above authorities.

D. Utilities: The Contractor shall coordinate with the various utility companies involved in this project and shall provide required utility relocations, extensions, modifications, and/or changes (complete in all respects) as described in the Contract Documents. Contractor shall verify the location of all existing utilities with the applicable Utility Company. The Contractor shall be responsible for all damages to existing utilities, whether indicated on drawings or not, and repair all damage to existing utilities as acceptable to the affected Utility Company.

E. Certification: Prior to final acceptance, the Contractor shall furnish a certificate of acceptance from the inspection departments having jurisdiction over the work for any and all work installed under this Contract. Any additional labor costs incurred as a result of a substitution shall be the Contractor's responsibility.

1.9 EXISTING FACILITIES

A. The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection, and in-service maintenance of all plumbing, heating, air conditioning, and ventilating services for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.

B. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being performed under this project.

C. Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork and equipment, etc. to provide this access and shall reinstall same upon completion of work in the areas affected.

D. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, all Contractors shall remove and reinstall in locations approved by the Architect/Engineer all devices required for the operation of the various systems installed in the existing construction. This is to include but is not limited to temperature controls system devices, electrical switches, relays, fixtures, piping, conduit, etc.

E. Outages of services as required by the new installation will be permitted but only at a time approved by the Owner. The Contractor shall allow the Owner two weeks in order to schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

1.10 DEMOLITION AND RELOCATION

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination or otherwise disposed of as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor's responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at no additional cost to the Owner.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

1.11 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. No substitution of materials or equipment herein specified or called for on the drawings will be permitted, except by written permission of the Owner's Representative. Where several makes of equipment or material are mentioned, any item named may be bid upon provided it meets space, capacity specifications, and other requirements.

1.12 SUBMITTALS

A. Submittals for Review:
   1. As soon as practical or within 30 days after the date of contract award or notice to proceed, and before purchasing or starting installation of any materials or equipment, the Contractor shall submit for review sufficient material and equipment data to indicate that all requirements of the specifications have been met and samples shall be furnished when requested. All manufacturer's data used as part of the submittal shall have all non-applicable features crossed out or deleted in a manner that will clearly indicate exactly what is to be furnished.
   2. Four (4) copies of the submittal list and detailed submittals (for the Owner's and A/E's use) shall be submitted to the Owner's Representative. The Contractor is requested to include a minimum of three (3) additional copies for insertion in the project's Owner's Manuals at the completion of the project, and the number of additional copies the Contractor requires for his and his subcontractor's use during the project's construction. The detailed submittals shall be accompanied by the same number of sets of pictorial and descriptive

data derived from the manufacturer's catalogs and sales literature, or incorporated in the shop drawings. The Contractor may provide a detailed submittal on any item even though not required by the Owner's Representative.

B. Format
1. Submittals shall be in pdf format. The first page shall have a cover sheet inserted with the title "MECHANICAL SUBMITTALS" centered in large print. Below the title shall be printed the name of the project, the date, the project location, the name and address of the contractor, the name and address of the subcontractor and the name and address of the engineer(s) in smaller print.
2. Provide a Table of Contents at the beginning of the binder that summarizes the information being submitted according to specification section.
3. Submittals shall be tab divided by specification section; **all sections** identified in the project specifications shall have a tab. When no information is being provided concerning a particular specification section, insert a single dated sheet that explains the circumstances.
4. **Loose-leaf or piecemeal submittals are not acceptable and subject to rejection unless prior approval has been granted by the Engineer.**

C. Content:
1. The Contractor shall prepare or cause to be prepared shop drawings, product data, materials and equipment lists, diagrams, data, samples, and other submittals as required by the contract documents, hereinafter referred to as "Submittal Data." The Contractor shall review and approve all submittal data for compliance with the contract documents, manufacturer's recommendations, adequacy, clearances, code compliance, safety, and coordination with associated work.
2. The Contractor shall submit approved submittal data to the Owner's Representative for review and comment as to general conformance with the design concept and general compliance with information given in the contract documents. Owner's Representative's review shall not include review of quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with other trades or work, or construction safety and precautions, all of which are the sole responsibility of the Contractor.
3. The Contractor shall clearly and specifically identify and call to the attention of the Owner's Representative any deviation from the contract documents for which Owner acceptance is desired. The responsibility for such a deviation accepted by the Owner shall remain with the Contractor.
4. Timeliness: The burden of timeliness in the complete cycle of submittal data is on the Contractor. The Contractor shall allow a minimum of four (4) weeks' time frame for review of each submission by the Owner's Representative. The Contractor is responsible for allowing sufficient time in the construction schedule to cover the aforementioned cycles of data processing, including time for all re-submission cycles on nonconforming materials, equipment, etc. covered by the data submitted. Construction delays and/or lack of timeliness in the above regard are the responsibility of the Contractor and will not justify any request for scheduled construction time extensions or extra compensation.
5. Work performed in accordance with approved submittal date that is not in accordance with the Contract Documents and did not have the specific acceptance of the Owner's Representative shall be replaced at Contractor's cost.

D. Re-submittals
1. Re-submit entire submittal in accordance with afore mentioned format and content requirements. **Loose-leaf or piecemeal re-submittals are not acceptable.** New and/or revised data for each section shall be prefaced with a colored (yellow, pink, orange, etc) cover sheet that identifies (in a word or two) the materials and/or equipment being re-submitted. Typeset the words "REVISED SUBMITTAL NO. 1 (or 2, 3 as applicable)" centered at the bottom of the cover sheet.
2. Subsequent re-submittals (second and third, if necessary) shall have different colored cover sheets to distinguish between the various re-submittals.

3. Include a cover letter at front of binder that specifically responds to each “REVISE AND RE-SUBMIT COMMENT” or “REJECTED” comment by number. Example responses would include the following:
   a. RESPONSE: “Please see attached re-submittal.”
   b. RESPONSE: “Will be re-submitted at a later date.”
   c. RESPONSE: “Requirement for (xxxxxx) was deleted in Addendum No. 2.”
   d. RESPONSE: “Exception requested based on Section xx, Paragraph x.x.x.

E. These paragraphs related to Mechanical submittal data supersede any conflicting requirements contained in Division 01 sections.

1.13 CONTRACTOR CERTIFICATION OF SUBMITTAL DATA

A. The Contractor shall provide the following notarized certificate with all submittal data furnished to the Owner’s Representative for review and comment.

Project Title:

Description of Submittal Data:

This is to certify that the above-described submittal data has been reviewed and is approved for compliance with the Contract Documents, manufacturer’s recommendation, adequacy, clearances, code compliance, safety, and coordination with other trades and/or work except as follows: (list “none” or itemize and explain). In addition, the Contractor shall submit to the Owner’s Representative a signed statement from each representative certifying as follows:

“I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer’s representative and is properly installed and operating in accordance with the manufacturer’s recommendations and are asbestos free.”

_____
Name and Company

Notary

1.14 ACCEPTANCE OF MATERIALS AND EQUIPMENT

A. All equipment installed on this project shall have **local (within 125 miles)** representation, local factory-authorized service, and a local stock of repair parts. This requirement is essential and will be strictly reviewed by the Owner’s Representative prior to concurrence with the Contractor’s approval for all submittals covered by Mechanical sections of this Specification.

B. NOTICE: The Contractor is responsible for providing materials and equipment that conform to the requirements of the project manual in every respect unless a deviation has been “accepted” in writing. Removal of any nonconforming materials and equipment and the replacement with conforming materials and equipment shall be at the Contractor’s sole expense, regardless of when nonconformance was discovered.

C. Approval of materials and equipment shall be based on manufacturer’s published data and shall be tentatively subject to the submission of complete shop drawings which comply with the

contract documents. Approval is also dependent upon the existence of adequate and acceptable clearances for entry, servicing, and maintenance.

D. Approval of materials and equipment under this provision shall not be construed as authorizing any deviations from the specifications, unless the attention of the Owner's Representative has been directed in writing to the specific deviations. Data submitted shall not contain unrelated information unless all pertinent information is properly identified.

E. Physical Size of Equipment: Space is critical; therefore, equipment of larger sizes than shown, even though of approved manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operation, and maintenance.

1.15 SHOP DRAWINGS

A. As soon as practicable after the award of contract and approval of materials and equipment, but prior to installation, complete and detailed shop drawings of the following shall be submitted for review and comment:
1. Equipment arrangements.
2. Duct layouts.
3. Piping layouts.
4. Layouts of equipment spaces indicating ductwork and piping larger than 2 inches.
5. Typical fittings and connections.
6. Equipment foundations.
7. Factory-fabricated equipment and materials.
8. Anchors.
9. Control.
10. Interlock.
11. Sprinkler locations.
12. Other details as directed by the Owner's Representative. Composite drawings of areas requiring coordination between trades shall be provided and expedited to eliminate conflicts and to ensure maximum cooperation and work progress.

B. Work performed without benefit of reviewed and approved shop drawings **will not be recommended for payment by the Engineer** until such time as the shop drawings are submitted, reviewed, and approved. Any work performed without the benefit of reviewed and approved shop drawings may require removal, relocation, and/or replacement at the Contractor's sole expense in order to resolve conflicts between the various systems and provide the performance specified.

C. All installation of equipment, fixtures, terminal devices, etc. shall be made in accordance with approved composite shop drawings. The Contractor shall modify installation and relocate installed work to provide code clearances, service access, and eliminate conflict with other systems.

D. Submit one print of shop drawings for each area, floor, system, etc. The print will be marked with the A/E's comments and returned to the Contractor. Contractor shall revise shop drawings, incorporate revisions in field and submit revised shop drawings at project close out.

1.16 SITE OBSERVATION

A. Site observation by the Architect, Engineer, and/or Owner's Representative is for the express purpose of verifying compliance by the Contractor with the contract documents, and shall not be construed as construction supervision nor indication of approval of the manner or location in which the work is being performed as being a safe practice or place.

1.17 SUPERVISION

A. In addition to the Superintendent required under the conditions of the contract, each subcontractor shall keep a competent superintendent or foreman on the job at all times.

B. It shall be the responsibility of each superintendent to study all plans and familiarize himself with the work to be done by other trades. He shall coordinate his work with other trades and, before material is fabricated or installed, make sure that his work will not cause an interference with another trade. Where interferences are encountered, they shall be resolved at the jobsite by the superintendents involved. Where interferences cannot be resolved without major changes to the plans, the matter shall be referred to the Owner's Representative for comments.

1.18 OPERATION PRIOR TO COMPLETION

A. When any piece of mechanical equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so, providing that he properly supervises the operation and has the written permission of the Owner's Representative to do so. The warranty period shall not commence, however, until such time as the equipment is operated for the beneficial use of the Owner or date of substantial completion, whichever occurs first.

B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of acceptance and the start of the warranty may not be the same date.

1.19 MANUFACTURER'S RECOMMENDATIONS

A. The manufacturer's published directions shall be followed in the delivery, storage, protection, installation, piping, and wiring of all equipment and material. The Contractor shall promptly notify the Owner's Representative, in writing, of any conflict between the requirements of the contract documents and the manufacturer's directions, and shall obtain the Owner's Representative's comments before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or applicable comments from the Owner's Representative, he shall bear all costs arising in connection with the correction of such deficiencies.

1.20 CHECKING AND TESTING MATERIALS AND/OR EQUIPMENT

A. Before final acceptance of the work, an authorized representative of the manufacturer of the installed materials and/or equipment shall personally inspect the installation and operation of his materials and/or equipment to determine that it is properly installed and in proper operating order. Testing and checking shall be accomplished during the course of the work where required by work being concealed, and at the completion of the work otherwise. In addition, the Contractor shall submit to the Owner's Representative a signed statement from each representative certifying as follows:

"I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations and are asbestos free."

B. Check inspections shall include plumbing, heating, air conditioning, ventilating, mechanical control and electrical equipment, and such other items hereinafter specified or specifically designated by the Owner's Representative.

1.21 OPERATING AND MAINTENANCE INSTRUCTION

A. The Contractor shall prepare for the owner's manual hereinafter specified complete sets of operating and maintenance instructions, system piping, valving, control and interlock diagrams, manuals, parts lists, etc. for each item of equipment. These are to be assembled as hereinafter specified for owner's manual.

B. In addition, the Contractor shall provide the service of a competent engineer or a technician acceptable to the Owner's Representative to instruct a representative of the Owner in the complete and detailed operation of all equipment and systems. These instructions shall be provided for a period of sufficient duration to fully accomplish the desired results. Upon completion of these instructions, a letter of release will be required, acknowledged by the Owner, stating the dates of instruction and personnel to whom instructions were given.

C. Additional diagrams, operating instructions, etc. shall be provided as specified hereinafter in the other sections of these specifications.

1.22 MATERIAL AND EQUIPMENT SCHEDULES

A. Contractor shall refer to both drawings and specification for schedules. Where reference is made to items "scheduled on drawings" or "scheduled in specifications," same shall include schedules contained in both the drawings and the specifications. The Contractor's attention is directed to the various specification sections and drawings for schedules.

1.23 APPLICABLE CODES AND STANDARDS

A. The installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of these specifications, except as may be hereinafter specifically modified in these specifications and associated drawings.
   1. National Fire Protection Association Standards (NFPA):
      NFPA 10 - Portable Fire Extinguishers
      NFPA 54 - National Fuel and Gas Code
      NFPA 70 - National Electrical Code
      NFPA 90A - Air Conditioning Systems
      NFPA 101 - Life Safety Code
      NFPA 255 - Method of Test of Surface Burning Characteristics of Building Materials
   2. American National Standards Institute (ANSI):
      15-78 - Safety Code for Mechanical Refrigeration
      C.2 - 1984 National Electrical Safety Code
      A117.1 - Handicapped Code
   3. American Society of Mechanical Engineers (ASME): Section IV, V, CSD-1
   4. Air Conditioning and Refrigeration Institute Standards (ARI): All standards related to refrigeration and air conditioning equipment and piping furnished under these specifications.
   5. American Water Works Association (AWWA): All applicable manuals and standards.
   6. Sheet Metal and Air Conditioning Contractors National Associate, Inc, (SMACNA): All applicable manuals and standards.
   7. Air Moving and Conditioning Association (AMCA): All applicable manuals and standards.
   8. American Society of Testing Materials (ASTM): All applicable manuals and standards.
   9. National Electrical Manufacturers' Association (NEMA): All applicable manuals and standards.
   10. Occupational Safety and Health ACT (OSHA):
       National Sanitation Foundation - Standard No. 2
   11. American Society of Heating, Refrigeration, and Air conditioning Engineers (ASHRAE):
       ASHRAE 90.1

12. Americans with Disabilities Act, 1990
13. American Gas Association (AGA)
14. Underwriters Laboratories, Inc. (UL)
15. Manufacturer's Standardization Society of the Valve and Fitting Industry (MSS)
16. Applicable Local and State Building Codes (International Building Codes, as amended):
17. Applicable Local and State Mechanical Code (International Mechanical Code, as amended).
18. Applicable Local and State Plumbing Code (International Plumbing Code, as amended).
19. Applicable Local and State Energy Code (International Energy Conservation Code, as amended).
20. Applicable State Gas Code (International Fuel and Gas Code, as amended).

B. All materials and workmanship shall comply with all applicable city, state, and national codes, specifications, and industry standards. All materials shall be listed by the Underwriters Laboratories, Inc. as conforming to its standards and so labeled in every case where such a standard has been established for the particular type of material in question.

C. The contract documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately notify the Owner's Representative in writing of said discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by Division 1 of these contract documents, providing no work or fabrication of materials has been accomplished in a manner of noncompliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules, and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations.

1.24 DEFINITIONS

A. Refer to the condition of the contract for Division 1 for additional requirements regarding definitions.

B. Where "as required" or "as necessary" is used in these specifications or on the drawings, it shall mean "that situations exist that are not necessarily described in detail or indicated that may cause the Contractor certain coordination requirements in performing the work described or indicated. These coordination requirements entail the normal coordination activities expected of the Contractor where multiple trades are involved and new or existing construction causes deviations to otherwise simplistic approaches to the work to be performed. The term shall not be interpreted to permit an option on the part of the Contractor to achieve the end result."

C. Where "and/or" is used in these specifications or on the drawings, it shall mean "that situations exist where either one or both conditions occur or are required and shall not be interpreted to permit an option on the part of the Contractor.

1.25 FINAL INSPECTION

A. Refer to Division 1 for additional requirements for final inspection.

B. It shall be the responsibility of the Contractor to personally conduct a careful inspection, assuring himself that the work on the project is ready for final acceptance and developing his own "punchlists," before calling upon the Owner's Representative to make a final inspection. Failure of the Contractor to conduct such inspections and provide the Owner's Representative with a copy of his "punchlists" prior to the final inspection shall be adequate cause for the Owner's Representative to cancel any Contractor-requested final inspection.

C. In order not to delay final acceptance of the work, the Contractor shall conduct his own “final inspections” prior to requesting the Owner’s Representative to “final” the project; will have all necessary bonds, guarantees, receipts, affidavits, etc. called for in the various articles of this specification prepared and signed in advance; and together with a letter of transmittal listing each paper included, shall deliver the same to the Owner’s Representative at or before the time of said final inspection. The Contractor is cautioned to check over each bond, receipt, etc. before preparing same for submission to see that the terms check with the requirements of the specifications.

D. The final inspection will be made jointly by the Owner’s Representative and the Owner.

1.26 REQUIREMENTS FOR FINAL ACCEPTANCE

A. Requirements for final acceptance shall include but not be limited to the Contractor accomplishing the following:
   1. Construction: Complete all construction.
   2. Deficiency Lists: Correct all deficiencies listed at time of Substantial Completion.
   3. Owner’s Manual: Submit at least 30 days prior to final acceptance on (1) copy of the owner’s manual for the Owner’s Representative’s review and comments. Following acceptance, prepare three (3) copies of bound and indexed owner’s manual, to be delivered at the time of final acceptance, which shall include but not be limited to the following:
      a. System operating instructions.
      b. System control drawings.
      c. System interlock drawings.
      d. System maintenance instructions.
      e. Manufacturers’, suppliers’, and subcontractors’ names, addresses, and telephone numbers, both local representatives and manufacturers’ service headquarters.
      f. Equipment operating and maintenance instructions and parts lists.
      g. Manufacturer’s certifications (see Checking and Testing Materials and/or Equipment, this section).
      h. Contractor’s warranty.
      i. Acceptance certificates of authorities having jurisdiction.
      j. Log of all tests made during course of work.
      k. Owner’s acknowledgment of receipt of instruction, enumerating items in owner’s manual.
      l. List of manufacturers’ guarantees executed by the Contractor.
      m. Certified performance curves.
      n. Balance and performance test reports.
      o. Owner’s acknowledgment of items of equipment or accessories indicated or specified to be turned over to Owner.
   4. Instructions:
      a. Verbal, as herein specified.
      b. Posted, framed under glass or plastic laminated:
         1) System operating instructions.
         2) System control drawings.
         3) System interlock drawings.
   5. Record Drawings: Deliver the specified record drawings to the Owner’s Representative.

1.27 RECORD DRAWINGS

A. The Contractor shall maintain a set of contract drawings (black-line prints) at the jobsite on which he shall indicate the installed (as-built) locations of the following:
   1. Equipment
   2. Main lines of piping and ductwork.

3. Dimensional locations (including depth) of all underground piping, valves and conduits.

B. Drawings shall be used for construction reference and shall not leave the field office of the jobsite.

C. Drawings shall include all addenda, ASI's, Change Orders, and existing conditions and equipment that are not reflected in the original contract drawings.

D. Upon completion of work, the Contractor shall obtain CAD files of the contract drawings from the Owner's Representative and transfer the above as-built information into these files. The as-built files shall be permanently marked "RECORD DRAWINGS" and printed on full-size Mylar sheets. Upon completion, the CAD files shall be transferred to CD in AutoCAD 2007 format. Both the CAD files CD and Mylar drawings shall be submitted to the Owner's Representative as part of the Close-out Submittals.

E. Refer to Division 1 paragraph entitled "Record Documents" for additional requirements.

1.28 ALLOWANCES

A. Refer to Division 1 for allowances.

1.29 ALTERNATE PROPOSALS

A. Alternate proposals are summarized in Division 1 and on the bid proposal form. Refer to all sections of the specifications and the drawings to determine the exact extent and scope of the various alternate proposals as each pertains to the work of the various trades.

1.30 WARRANTY

A. General: All work performed (including equipment and materials furnished) under the various sections of these specifications shall be 100% warranted, for a period of one (1) year from the date of final acceptance thereof, against defective materials, design, and unauthorized substitution. Upon receipt of note of failure of any part of the guaranteed equipment and/or facilities during the guaranty period, the affected part(s) or facilities shall be replaced promptly with new parts, etc. by and at the expense of the Contractor. Further, the Contractor shall properly obtain, execute, and forward any and all manufacturer's warranties on equipment furnished under the Contract. Refer to Division 1 for additional requirements.

B. Extended Period: The Contractor shall provide all extended time warranties available from the manufacturer of the equipment provided as standard at no additional cost. This includes all extended warranties where specified with certain equipment as directed in other sections of this Specification.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. All materials, unless otherwise specified, shall be current United States manufacture, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.

B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be

executed by mechanics skilled in their respective trades, and the installations shall present a neat, precise appearance.

C. The responsibility for the furnishing and installation of the proper mechanical equipment and/or material as intended rests entirely upon the Contractor. The Contractor shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

2.2 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS

A. Duct coverings, duct linings, vapor barrier facings, tapes, adhesives, core materials, insulation, jackets, piping (of any sort), and other materials in concealed locations, including any above-ceiling area, shall have a flame spread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating no higher than 50. Flame spread and smoke developed ratings shall be in accordance with NFPA Standard No. 255.

2.3 BEARINGS

A. All ball bearings shall be of radial and/or thrust type, and enclosed in a dust and moisture-proof housing.

2.4 MOTORS

A. The Contractor shall provide all motors required for equipment supplied under each portion of the work. Motors shall be premium efficiency and be built in accordance with the latest ANSI, IEE, and NEMA standards, shall be fully coordinated with the equipment served, shall be of sizes and electrical characteristics scheduled.

2.5 STARTING EQUIPMENT

A. Each motor shall be provided with proper starting equipment. This equipment, unless hereinafter specified or scheduled to the contrary, shall be provided by the trade furnishing the motor. All motor starting equipment provided by any one trade shall be of the same manufacture unless such starting equipment is an integral part of the equipment on which the motor is mounted.

2.6 LOW VOLTAGE (CONTROLS/THERMOSTAT) WIRING

A. All low voltage wiring installed by the Mechanical Contractor, Electrical Contractor or Controls Vendor shall be run in a neat and workmen like manner, parallel and perpendicular to building lines on J-Hooks (above ceiling grid only). Plenum rated cable shall be installed above ceilings. All other locations (exposed, Mechanical Rooms, outdoors or above hard lid ceiling) should be installed in conduit.

2.7 SLEEVES, INSERTS, AND FASTENINGS

A. General: Proper openings through floors, walls, roofs, etc. for the passage of piping, ductwork, conduits, etc. shall be provided. All piping and conduit through floors and piping through walls must pass through sleeves except soil pipe installed under concrete slabs-on-fill, and pipe and conduit that is cast-in-place. Sleeves shall be set in new construction before concrete is poured, as cutting holes through any part of the concrete will not be permitted unless acceptable to the Owner’s Representative.

B. 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.

C. 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.

D. Sleeves: The minimum clearance between horizontal pipe, including insulation where applicable, and sleeve shall be 1/4 inch, except that the minimum clearance shall be 2 inches where piping contacts the ground. Sleeves through floors shall extend 3/4 inch above the floor; sleeves through walls and partitions shall be installed flush with exposed surfaces.

E. Materials: Install sleeves large enough to provide ¼” annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   1. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
   2. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
   3. 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.
      a) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.

F. Inserts: Suitable concrete inserts for pipe, conduit, and equipment hangers shall be set and properly located for all piping, conduit, and equipment to be suspended from concrete construction.

G. Fasteners: Fastening of pipes, conduits, etc. in the building shall be as follows:
   1. To wood members: by wood screws.
   2. To masonry and concrete: by threaded metal inserts, metal expansion screws, or toggle bolts, whichever is appropriate for the particular type of masonry or concrete.
   3. To steel: machine screws or welding (when specifically permitted or directed), or bolts.
      NOTE: Under no circumstances will the use of plastic anchors or plastic expansion shields be permitted for any purpose whatsoever.

H. Ratproofing: The open space around all piping, ductwork, etc. passing through the ground floor and/or exterior walls shall be ratproofed in a manner acceptable to the Owner’s Representative.

I. Weatherproofing: The annular space between a pipe and its sleeve in exterior walls or through floor to below grade shall be filled with polyurethane foam rods 50% greater in diameter than the space as backing and fill material and made watertight with a permanent elastic polysulfide compound. Seal both surfaces of wall or floor with a fire-resistant sealant.

J. Air Plenums: The space around piping, ductwork, etc. passing through an air plenum shall be made airtight in a manner acceptable to the Owner’s Representative. The sealant used must be fire resistant.

2.8 FIRE AND SMOKE PARTITION, WALL, AND/OR FLOOR PENETRATIONS

A. Pipe, ductwork, conduit, etc. shall pass through fire- or smoke-rated floors, partitions, walls, or other barriers within a UL-listed assembly which shall maintain the rating of the applicable wall, floor, partition, or barrier.

B. The Contractor shall review the architectural and structural drawings and determine the location of the fire-rated building elements. Where these elements are penetrated, UL-listed fire-rated penetration assemblies approved by the local authority shall be provided in accordance with the manufacturer's instructions to obtain the required rating.

2.9 METAL BUILDING SYSTEMS/MECHANICAL-ELECTRICAL SUPPORTS

A. Metal building systems are required to be designed by the manufacturer to accommodate and support the mechanical systems indicated on the mechanical drawings and specified in Mechanical specifications.

B. The metal building systems manufacturer is required to provide the following:
   1. Framed openings through the roofs with supports, roof curbs, and flashings for roof-mounted equipment, fans, vents, and air intakes.
   2. Structural support for piping, conduits, and suspended equipment consisting of beam, joists, purlins, and/or blocking above and perpendicular to pipe routes and equipment hangers at intervals not to exceed 8 feet.
   3. Structural support for suspended ceilings, diffusers, grilles, light fixtures including associated raceways and ductwork.

C. The mechanical trade shall:
   1. Provide all routes, weights, installation heights, opening locations, etc. for all equipment, piping, vents, etc. to the metal building system manufacturer and coordinate requirements for structural supports, hangers, attachments, etc. with the metal building systems manufacturer.
   2. Provide all supporting devices (hangers, attachments, brackets, cross beams, etc.) to attach to the metal building structural system.

2.10 FOUNDATIONS / HOUSEKEEPING PADS

A. General: All special foundations and supports required for the proper installation of equipment and pipe shall be provided as hereinafter specified and under the section of the specifications covering the equipment, unless otherwise indicated on the drawings.

B. All mechanical equipment shall receive concrete housekeeping pads unless otherwise noted. Equipment to receive pads are to include (but not limited to): air handlers, fan-coils, condensing units, boilers, water heaters, water softeners, expansion / compression tanks, filter feeders, water treatment equipment, air compressors, fans, pumps (in addition to inertia bases where required), chillers, surge tanks, deareators, etc.

C. Concrete foundations for the support of equipment such as floor-mounted pumps, fans, etc. shall be not less than 5½ inches high and not less than 4 inches larger (in both directions) than supported unit, unless otherwise noted and shall be poured in forms built of new dressed lumber. All corners of the foundations shall be neatly chamferred by means of sheet metal or triangular wood strips nailed to the form. Pads shall not be laid out directly against walls or structures. 2 inches shall be left available for pad form work. Foundation bolts shall be placed in the forms when the concrete is poured, the bolts being correctly located by means of templates. Allow 1 inch below the equipment bases for alignment and grouting (where applicable). Foundations for equipment located on the exterior of the building shall be provided as indicated. Foundations shall be constructed in accordance with approved shop drawings and shall be reinforced with #4 bars at 12 inches on center both ways (minimum).

D. Pipe and Conduit Support: All pipes and conduits throughout the building, both horizontal and vertical, shall be adequately supported from the construction to line of grade, with proper provision for expansion, contraction, vibration elimination, and anchorage. Vertical pipes and conduits shall be supported from floor lines with riser clamps sized to fit the lines and to adequately support their weight. At the bases of lines, where required for proper support, provide anchor base fittings or other approved supports.

2.11 ACCESS DOORS

A. General: Provide access doors for all serviceable mechanical appurtenances (valves, trap primers, shock arresters, volume dampers, fire/smoke dampers, actuators, sensors, etcetera) in inaccessible locations. Such locations include gypsum, brick and CMU ceilings and walls.

B. Location of panels shall be carefully coordinated with other Exposed Devices as described in earlier paragraphs.

C. Manufacturers shall be Inland-Milcor, Bilco, Miami Carey, or approved equal. Unless indicated otherwise, use panels equal to Milcor Style M for masonry and drywall construction, equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile.

D. Minimum construction features include 14-gage frame and door, continuous hinges, cam-style latch and 10x10" unobstructed opening size.

E. UL labeled when in fire-rated construction, one and one-half hour rating.

F. Access doors located outside, in restrooms or in a moisture-laden environment (dressing area, shower area, lockers, etc.) shall be stainless steel construction.

G. Equipment access doors shall be of sufficient size to remove/replace equipment and provide routine maintenance as necessary, unless otherwise noted. Doors shall be set flush with adjacent finish surfaces. Exterior doors shall be provided with cylinder locks.

H. Access doors into ductwork shall be 14-gauge insulated galvanized steel with 16-gauge galvanized gasketed steel frame and cam-type locks. Ductwork access door shall be a minimum of 12" $\times$ 12" in size.

2.12 FLOOR AND CEILING PLATES

A. Except as otherwise noted, provide one-piece chrome-plated brass floor and ceiling plates (or escutcheons) around all pipes, conduits, etc. passing through walls, floors, or ceilings in any spaces, except underfloor and attic spaces. Plates shall be sized to fit snugly against the outside of the pipe or against the outside of insulation on lines which are insulated, and positively secured to such pipe or insulation. Plates will not be required for piping where pipe sleeves extend ¾ of an inch above finish floor and are concealed. Plates shall be one piece.

PART 3 - EXECUTION

3.1 SPACE AND EQUIPMENT ARRANGEMENT

A. The size of mechanical equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers will be acceptable, it is the responsibility of the Contractor to determine whether the equipment he proposes to furnish will fit in the space.

Shop drawings shall be prepared when required by the Owner's Representative to indicate a suitable arrangement.

B. All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.

3.2 LARGE APPARATUS

A. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

3.3 PROTECTION

A. The Contractor shall take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the uncompleted building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.

B. The Contractor shall protect existing facilities, the work of others, and the premises from any and all damages that may be made possible by the execution of work.

C. Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these specifications.

3.4 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

A. Each trade, subcontractor, and/or Contractor must work in harmony with the various trades, subcontractors, and/or Contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or Contractor must pursue its work promptly and carefully so as not to delay the general progress of the job. This Contractor shall work in harmony with Contractors working under other contracts on the premises.

B. It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the jobsite in a clean and safe condition. At the end of each day's work, each trade shall properly store all of its tools, equipment, and materials and shall clean its debris from the job. Upon the completion of the job, each trade shall immediately remove all of its tools, equipment, any surplus materials, and all debris caused by its portion of the work.

3.5 PRECEDENCE OF MATERIALS AND COORINATION OF WORK

A. These specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the several available spaces, and which will ensure complete and satisfactory systems. Each subcontractor and/or trade shall be responsible for the proper fitting of his material and apparatus into the building.

B. The work of the various trades shall be performed in the most direct and workmanlike manner without hindering or handicapping the work of other trades. Piping interferences shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Where space requirements conflict, the following order or precedence shall, in general, be observed:
   1. Building lines.
   2. Structural members.
   3. Light fixtures.
   4. Soil and drain piping.
   5. Condensate drains.
   6. Vent piping.
   7. Supply, return, and outside air ductwork.
   8. Exhaust ductwork.
   9. HVAC water and steam piping.
   10. Steam condensate piping.
   11. Fire protection piping.
   12. Natural gas piping.
   13. Domestic water (cold and hot).
   14. Refrigerant piping.
   15. Electrical conduit.

C. The light fixture grid layout as indicated on the drawings must be maintained. This Contractor shall refer to all light fixture plans and details indicated on the drawings and shall coordinate the location of dampers, supply grilles, return air grilles, sprinkler heads, etc. with the location of the light fixtures to assure proper access to all items in a manner acceptable to the Owner's Representative.

D. The electrical trades shall locate all junction boxes, pull boxes, conduits, etc. to avoid interference with the diffusers, dampers, grilles, etc. hereinbefore mentioned. The mechanical trades shall furnish to all other trades copies of approved ductwork shop drawings to assist in the coordination of the rough-in and installation of all items of work.

3.6 CONNECTIONS FOR OTHERS

A. This Contractor shall rough-in for and make all water, sewer, electrical, etc. connections to all fixtures, equipment, machinery, etc. provided by others in accordance with detailed roughing-in drawings provided by the equipment suppliers, by actual measurements of the equipment connections, or as detailed.

B. After the equipment is set in place, this Contractor shall make all final connections and shall provide all required pipe, fittings, valves, traps, connectors, etc.

C. Provide all air gap fittings required, using materials hereinbefore specified. In each water line serving an item of equipment or piece of machinery, provide a shutoff valve. On each drain without integral trap provide a suitable trap.

D. All pipe fittings, valves, traps, etc. exposed in finished areas and connected to chrome-plated lines provided by others shall be chrome-plated to match.

E. Provide all sheet metal ducts, transition pieces, etc. required for a complete installation of equipment provided by others.

3.7 INSTALLATION METHODS

A. Where to Conceal: All pipes and conduits shall be concealed in pipe chases, walls, furred spaces, below suspended floors, or above the ceilings of the building unless otherwise indicated.

B. Where to Expose: In mechanical rooms, janitor's closets tight against pan soffits in exposed Tee structures, or storage spaces, but only where necessary, piping and conduit may be run exposed. All exposed piping and conduit shall be run in the neatest, most inconspicuous manner, and parallel or perpendicular to the building lines.

C. Support: All piping and conduit shall be adequately and properly supported from the building structure by means of hanger rods or clamps to walls as herein specified.

D. Maintaining Clearance: Where limited space is available above the ceilings and below concrete beams or other deep projections, pipe and conduit shall be sleeved through the projection where it crosses, rather than hung below them, in a manner to provide maximum above-floor clearance. Sleeves shall be as herein specified. Approval shall be obtained from the Owner's Representative for each penetration.

E. All pipe, conduits, etc. shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes, and conduits run exposed in machinery and equipment rooms shall be installed parallel to the building lines, except that they shall be sloped to obtain the proper pitch. Piping and ducts run in furred ceilings, etc. shall be similarly installed, except as otherwise shown. Conduits in furred ceilings and in other concealed spaces may be run at angles to the construction but shall be neatly grouped and racked indicating good workmanship. All conduit and pipe openings shall be kept closed until the systems are closed with final connections.

F. Special Requirements:
1. There shall be no pipe joints nearer than 12 inches to a wall, ceiling, or floor penetration unless pipe joint is a welded or mechanically-coupled-type joint.
2. The Contractor shall study all construction documents and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of the extremely limited spaces. Where conflicts occur the Contractor shall meet with all involved trades and the Owner's Representative and resolve the conflict prior to erection of any work in the area involved.
3. All piping not directly buried in the ground shall be considered as "interior piping."
4. Prior to the installation of any ceiling material, gypsum, plaster, or acoustical board, the Contractor shall notify the Owner's Representative so that arrangements can be made for an inspection of the above-ceiling area about to be "sealed off." The Contractor shall give as much advance notice as possible up to ten (10) working days, but in no case less than five (5) working days.
5. The purpose of this inspection is to verify the completeness and quality of the installation of the air conditioning systems, the plumbing systems, and any other special above-ceiling systems such as pneumatic tube. The ceiling supports (tee bar or lath) should be in place so that access panel and light fixture locations are identifiable and so that clearances and access provisions may be evaluated.
6. No ceiling material shall be installed until the deficiencies listed from this inspection have been corrected to the satisfaction of the Owner's Representative.

3.8 CUTTING AND PATCHING

A. General: Cut and patch walls, floors, etc. resulting from work in existing construction or where made necessary by failure to provide proper openings or recesses in new construction.

B. Methods of Cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Owner's Representative. Impact-type equipment will not be used except where specifically acceptable to the Owner's Representative. Openings in concrete for pipes, conduits, outlet boxes, etc. shall be core drilled to exact size. **Determine location of embedded conduit and reinforcing bars prior to cutting.**

C. Restoration: All openings shall be restored to “as-new” condition under the appropriate specification section for the materials involved, and shall match remaining surrounding materials and/or finishes.

D. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc. shall be of the proper size and shape, and shall be installed in a manner acceptable to the Owner’s Representative.

E. Plaster: All mechanical work in area containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.

F. Weakening: No cutting, boring, or excavating which will weaken the structure shall be undertaken.

3.9 ROOF PENETRATIONS AND FLASHING

A. Pipe and conduit ducts, pitch pockets, curb bases, and flashing compatible with the roofing installation shall be provided for roof penetrations. Provide framing or other support around all openings through roof as required to preserve the structural integrity of the roof system and make the penetration weathertight.

B. Provide 30-inch round or square flashing acceptable to the roofing trades at all roof and deck drain and sleeve flashing locations.

C. Roof curbs for all roofs except standing seam metal roofs shall be provided by the equipment supplier supplying the roof-mounted equipment, etc., and such curbs shall be installed by the roofing trades. Contractor shall coordinate all roof curb requirements with all trades and the roofing trades at the earliest possible stage of the project.

D. Roof curbs for standing seam metal roofs shall be provided by the roofing trades. Curb base size, height, and type shall be coordinated with the roofing trades at the earliest possible stage of the project.

E. Flashing for pipe and conduit penetrations of standing seam metal roofs shall be provided and installed by the roofing trades.

3.10 EXCAVATING AND BACKFILLING

A. Perform trenching, excavating, backfilling for mechanical work as set forth below.

B. Depth of excavation to provide a minimum of 3 feet above top of pipe. Excavation to be carried to a depth of at least 6 inches below bottom of pipe elevation. Fill below pipe (6 inches), around pipe, and a minimum of 12 inches above pipe with sand of Class “B” crushed stone tamped firm and even. Separate topsoil during excavation. Final layer of dirt (12 inches minimum) to be topsoil. Trenches to be at least 18 inches wider than pipe with batter boards placed every 25 feet. Backfilling shall be done to exclude use of rock or stone above sand or Class “B” crushed stone.

3.11 TESTS AND INSPECTIONS

A. General: The Contractor shall make all tests deemed necessary by the inspection departments of the authority having jurisdiction, Board of Underwriters, etc. He shall provide all equipment, materials, and labor for making such tests. Fuel and electrical energy for system operational tests following beneficial occupancy by the Owner will be paid for by the Owner.

B. Other: Additional tests specified hereinafter under the various specifications sections shall be made.

C. Notification: The Owner's Representative shall be notified at his office 36 hours prior to each test and other specifications requirements requiring action on the part of the Owner, Architect, Engineer, and/or Owner's Representative.

D. Test Logs: All tests which the Contractor conducts shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel, description and extent of system tested, test conditions, test results, specified results, and any other pertinent data. Data shall be delivered to the Owner's Representative as specified under "Requirements for Final Acceptance.

E. Inspections: In general, an inspection by the Owner's Representative shall be required prior to closing up any work and prior to beneficial occupancy or final project completion. The closing up of work includes, but is not limited to, pipe and conduit installations prior to backfilling; mechanical, electrical, and fire protection work prior to placement of concrete; or closing up walls and overhead mechanical, electrical, and fire protection work prior to installation of the ceiling.

3.12 CLEANING AND PAINTING

A. Thoroughly clean and touch up the finish on all parts of the materials and equipment. Exposed parts in equipment rooms, and all other spaces except sealed chases and attics shall be thoroughly cleaned of cement, plaster, and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

B. Exposed metal work which is not galvanized shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean and then painted with a suitable rust resistant primer. Exposed metal work includes work exterior to the building; exposed in mechanical or electrical equipment rooms and storage rooms; and other areas where occupants could see the work, whether normally occupied or not.

C. All other painting shall be accomplished under the Painting Section of Division 9 of the specifications.

3.13 DISCHARGE OF WASTES FROM CONSTRUCTION SITE

A. The Contractor shall comply with all applicable provisions of local, state, and federal laws regarding the discharge of wastes into sewer and waterways. Special caution shall be exercised to prevent the discharge of wastes which contain oil, tar, asphalt, roofing compound, kerosene, gasoline, paint, mud, cement, lime, or other materials which would degrade the water quality of the receiving water course. The Contractor shall construct and maintain oil interceptors, settling basins, acid neutralization tanks, and/or other effective pollution countermeasures, as required by the Texas Water Quality Board.

END OF SECTION

SECTION 23 0513

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Mechanical Sections.
   1. Piping materials and installation instructions common to most piping systems.
   2. Concrete base construction requirements.
   3. Escutcheons.
   4. Dielectric fittings.
   5. Dielectric isolation tape
   6. Flexible connectors.
   7. Mechanical sleeve seals.
   8. Nonshrink grout for equipment installations.
   9. Field-fabricated metal and wood equipment supports.
   10. Installation requirements common to equipment specification sections.
   11. Mechanical demolition.
   12. Cutting and patching.
   13. Touchup painting and finishing.
   14. Access Doors

B. Pipe and pipe fitting materials are specified in mechanical piping system Sections, if applicable.

1.2 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.

1.3 SUBMITTALS

A. Product Data: For dielectric fittings, flexible connectors, access doors, solder/brazing material and mechanical sleeve seals.

B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

C. 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. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
   2. Equipment and accessory service connections and support details.
   3. Fire-rated wall and floor penetrations.
   4. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
   5. Access panel and door locations

1.4 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.

1.5 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.

1.6 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.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Dielectric Tape:
      a. Holdrite (#272-4).
   2. Metal, Flexible Connectors:
      a. Flexicraft Industries.
      b. Flex-Hose, Co., Inc.
      c. Grinnell Corp.; Grinnell Supply Sales Co.
      d. Mercer Rubber Co.
      e. Metraflex Co.
      f. Uniflex, Inc.
   3. Rubber, Flexible Connectors:
      a. General Rubber Corp.
      b. Mercer Rubber Co.
      c. Metraflex Co.
      d. Red Valve Co., Inc.
      e. Uniflex, Inc.
   4. Mechanical Sleeve Seals:
      a. Calpico, Inc.
      b. Metraflex Co.
      c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Specification piping Sections for pipe and fitting materials and joining methods, if applicable.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Specification piping Sections for special joining materials not listed below, if applicable.

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. ASTM B 32, 95/5 lead-free alloys. Include water –flushable and soluble flux according to ASTM B 813.

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. CPVC Piping: ASTM F 493.
   2. PVC Piping: ASTM D 2564, medium bodied (bond). Include purple primer according to ASTM F 656.

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 Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature, to prevent galvanic action and stop corrosion. Unions in first paragraph below are available in at least NPS 1/2 to NPS 2.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   f. Zurn Mechanical Products Group; Wilkins Water Control Products.
2. Description:
   a. Pressure Rating: 250 psig at 180 deg F.
   b. End Connections: Solder-joint copper alloy and threaded ferrous.
   c. Flanges in first paragraph below are available in at least NPS 1-1/2 to NPS 4.

C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
   a. Factory-fabricated, bolted, companion-flange assembly.
   b. Pressure Rating: 175 psig minimum.
   c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.
2. Description:
   a. Nonconducting materials for field assembly of companion flanges.
   b. Pressure Rating: 150 psig.
   c. Gasket: Neoprene or phenolic.
   d. Bolt Sleeves: Phenolic or polyethylene.
   e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Calpico, Inc.
   b. Lochinvar Corporation.
2. Description:
   a. Galvanized-steel coupling.
   b. Pressure Rating: 300 psig at 225 deg F.
   c. End Connections: Female threaded.
   d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Perfection Corporation; a subsidiary of American Meter Company.
   b. Precision Mechanical Products, Inc.

c. Victaulic Company.

2. Description:
   a. Electroplated steel nipple complying with ASTM F 1545.
   b. Pressure Rating: 300 psig at 225 deg F.
   c. End Connections: Male threaded or grooved.
   d. Lining: Inert and noncorrosive, propylene.

2.5 DIELECTRIC ISOLATION TAPE

A. Tape to eliminate dissimilar metal contact: (equal to Holdrite #272-4)
   1. White Polyester Felt. Pressure sensitive adhesive rubber base (one side only).
   2. 4” width.

2.6 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. 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.

2.7 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.
   1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe materials and size of pipe.
   2. Pressure Plates: Stainless steel.
   3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.8 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. Sleeve Fasteners: Manufactured, steel clips for securement during pour. Equal to B-line, BD40, BE-5-8 or BE-9-12.

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. (split face acceptable for existing piping)
      a. Finish: Polished chrome-plate.

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.

2.10 ACCESS DOORS

A. General: Provide access doors for all serviceable mechanical appurtenances (valves, trap primers, shock arresters, actuators, sensors, etcetera) in inaccessible locations. Such locations include gypsum, brick and CMU ceilings and walls.

B. Location of panels shall be carefully coordinated with other Exposed Devices as described in earlier paragraphs.

C. Manufacturers shall be Milcor, Mifab, or approved equal. Unless indicated otherwise, use panels equal to Milcor Style M for masonry and drywall construction, equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile.

D. Minimum construction features include 16-gage frame and door, continuous hinges, cam-style latch and 10x10" unobstructed opening size.

E. UL labeled when in fire-rated construction, one and one-half hour rating.

F. Access doors located outside, in restrooms or in a moisture-laden environment (dressing area, shower area, lockers, etcetera) shall be stainless steel construction.

G. Equipment access doors shall be of sufficient size to remove/replace equipment and provide routine maintenance as necessary, unless otherwise noted. Doors shall be set flush with adjacent finish surfaces. All access doors shall be provided with cylinder locks. All access doors (MEP) shall have one (1) common key.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS AND APPLICATIONS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual 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. All piping to be installed in compliance with current NEC required clearances.

D. Install manufactured isolation clamps at all dissimilar metal pipe supports. Install dielectric isolation tape (engineer approved) only when a manufactured isolation clamp is not available.

E. Install piping at indicated slope.

F. Install components with pressure rating equal to or greater than system operating pressure.

G. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

H. Install piping free of sags and bends.

I. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

J. 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.

K. Install piping to allow application of insulation plus 1-inch clearance around insulation.

L. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

M. Install fittings for changes in direction and branch connections.

N. Install couplings according to manufacturer's written instructions.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Section "Penetration Firestopping" for firestop materials and installations.
   1. Fire-stop all sleeves at floor penetrations of multistory buildings including underfloor penetrations.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

R. 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. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
   5. 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.

6. 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.
7. 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.
8. 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. CPVC Piping: ASTM D 2846 and ASTM F 493.
   c. PVC Pressure Piping: ASTM D 2672.
   d. PVC Nonpressure Piping: ASTM D 2855.
9. 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.

3.2 ESCUTCHEON REQUIREMENTS

A. Install escutcheons at pipe penetrations of walls, ceilings, and floors in finished areas.
   1. Escutcheons for New Piping:
      a. Piping exposed through floors and walls in finished areas: One piece, cast brass with polished chrome-plated finish with set screw. Deep escutcheons to be provided where standard depth will not fit.
      b. Escutcheons shall cover entire hole penetration.
      c. Escutcheon to be appropriately sized for pipe.
   2. Escutcheons for Existing piping:
      a. Piping exposed through floors and walls in finished areas: Split plate, cast brass with polished chrome-plated finish with set screw. Deep escutcheons to be provided where standard depth will not fit.
      b. Escutcheons shall cover entire hole penetration.
      c. Escutcheon to be appropriately sized for pipe.
   3. 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.

3.3 PIPE SLEEVE INSTALLATION REQUIREMENTS

A. Pipe sleeves are required at all through wall and floor penetrations.
   1. Sleeves are to be of the following material:
      a. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

2. Sleeves are required for all through floor and wall penetrations. Sleeves to be set and poured in place (in slab applications), secure all sleeves with fasteners.
3. Sleeves to extend 2 inches past face of floor or wall. Pipe sleeve in finished areas to be flush with wall or floor for installation of escutcheon.
4. Install sleeves in new partitions, slabs, and walls as they are built.
5. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Section "Joint Sealants" for joint sealants.
6. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Section "Joint Sealants" for joint sealants.
7. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.
8. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated. Seal annular space with water tight sealant. (equal to NP-1). All sleeves and penetrations to maintain rating of wall / floor. Seal pipe penetrations with fire-stopping materials.
9. Install sleeve materials according to the following applications:
    a. Sleeves for Piping Passing through Concrete Floor Slabs: galvanized steel pipe.
    b. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe sleeves.
        1) Extend sleeves 2 inches above finished floor level.
        2) For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Comply with requirements in Section "Sheet Metal Flashing and Trim" for flashing.
10. Sleeves for Piping Passing through Gypsum-Board Partitions:
    a. Galvanized-steel pipe sleeves.
    b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual mechanical fixtures if escutcheons will cover openings.
11. Sleeves for Piping Passing through Concrete Roof Slabs: Reference details.
12. Sleeves for Piping Passing through Exterior Concrete Walls:
    a. Galvanized-steel pipe sleeves.
    b. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
13. Sleeves for Piping Passing through Interior Concrete Walls:
    a. Galvanized-steel pipe sleeves.
14. Mechanical sleeve seals
    a. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building. Sleeves must be poured in place. Installation of sleeves after wall is constructed is not acceptable.
    b. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

B. 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.

3.4 DIELECTRIC FITTING INSTALLATION

A. 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.

B. 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.

3.5 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.

3.6 PAINTING AND FINISHING

A. 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.

B. Do not paint piping specialties with factory-applied finish.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 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."

3.8 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 (not to be used at pipe supports).

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.

3.9 DEMOLITION

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 CUTTING AND PATCHING

A. Disconnect, demolish, and remove Work specified in Mechanical 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.

3.11 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

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:
   1. Steel pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Metal framing systems.
   4. Thermal-hanger shield inserts.
   5. Fastener systems.
   6. Pipe positioning systems.
   7. Equipment supports.

B. Related Sections include the following:
   1. Specification Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
   2. Specification Section “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 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.

1.5 SUBMITTALS

A. Product Data: For the following:
   1. Steel pipe hangers and supports.
   2. Thermal-hanger shield inserts.
   3. Powder-actuated fastener systems.
   4. Pipe positioning 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. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METAL COATING REQUIREMENTS:

A. All metal products shall have the following coatings:
   1. Wet/damp areas: hot dipped galvanized.
   2. Dry or conditioned areas: pre-galvanized.

2.3 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. 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: Pre-galvanized (minimum thickness of 0.5 mils) or hot dipped (1.4 to 3.9 mil thickness).

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.

2.4 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.

2.5 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. 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 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig minimum, compressive-strength insulation insert with a sheet metal shield.

B. Manufacturers:
1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Buckaroos

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier. **Wood inserts are not acceptable.**

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. Insulation-Insert Material for Hot Piping only, up to 3” diameter: Molded fiberglass block, 20 lbs/ft^3 density, thermal conductivity of 0.30.

F. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

G. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

H. Insert Length: Extend 4 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.7 FASTENER SYSTEMS

A. 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. 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.

2.8 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:
1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars.
1. Exterior: Galvanized steel.
2. Interior: Black steel.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT 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 non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
   4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
   5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, 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.
   7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.
   8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.
   9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 2.
   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.
   11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
   12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
   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, 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, 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, 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, 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, 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, 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, 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, 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.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, 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 for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F 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 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.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
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. Thermal-Hanger Shield Inserts: For supporting insulated cold pipe. **Wood inserts are not acceptable.**

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.
   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; **attaching to metal roof decks is not permissible.**

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. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Specification Section "Plumbing Fixtures" for plumbing fixtures.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal 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.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

N. 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 B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install thermal-hanger shield inserts on insulated piping with vapor barrier. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

O. Insulated Ducts (Mineral Fiber Blanket). Comply with the following:
   1. At all unistrut supports provide mineral fiber board insert in between ductwork and unistrut. Insert to extend 12” on both sides of unistrut, full length of strut. Extend blanket between structural insert.

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.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 23 0553

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. This Section includes the following mechanical identification materials and their installation:
1. Equipment nameplates.
2. Equipment markers.
3. Equipment signs.
4. Access panel and door markers.
5. Pipe markers.
6. Duct markers.
7. Stencils.
8. Valve tags.
9. Valve schedules.
10. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals. Reproduce on 8½ × 11 bond. Tabulate valve number, piping system, system abbreviation as shown on tag, room or space location of valve, and variations for identification. Mark valves intended for emergency shutoff and similar special uses. Indicate normal operating positions (open, closed, modulating, or balance).

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 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 location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 GENERAL

A. Products specified are for applications referenced in other Mechanical sections. In addition to a factory installed equivalent nameplate, all equipment shall have an engraved equipment sign that matches the schedule tag name.

2.2 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
   1. Data:
      a. Manufacturer, product name, model number, and serial number.
      b. Capacity, operating and power characteristics, and essential data.
      c. Labels of tested compliances.
   2. Location: Accessible and visible.
   3. Fasteners: As required to mount on equipment.
   4. Material: Brass.

B. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
   1. Data: Instructions for operation of equipment and for safety procedures.
   2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
   3. Thickness: 1/8 inch, unless otherwise indicated.
   4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.3 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Manufacturers standard preprinted, semi-rigid, snap-on type.
   1. Colors: Comply with ASME A13.1, unless otherwise indicated.
   2. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
   3. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
   4. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
   5. Lettering: Manufacturers standard preprinted.

2.4 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive. See Execution section for color scheme.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Provide 5/32-inch hole for fastener.

1. Material: 0.032-inch thick aluminum.
2. Valve-Tag Fasteners: Brass S-hook.
3. Size: 1½ inches in diameter, unless otherwise indicated.

2.6 VALVE SCHEDULES

A. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.

B. Frame: Extruded aluminum.

C. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.7 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
1. Size: 3 by 5-1/4 inches **minimum**.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Mechanical Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
1. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
2. Pumps, compressors, chillers, condensers, and similar motor-driven units.
3. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
4. Fans, blowers, primary balancing dampers, and mixing boxes.
5. Packaged HVAC central-station and zone-type units.

B. Install equipment markers with permanent fasteners on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
   a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
   b. Fire department hose valves and hose stations.
   c. Meters, gages, thermometers, and similar units.
   d. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
   e. Pumps, compressors, chillers, condensers, and similar motor-driven units.
   f. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
   g. Fans, blowers, primary balancing dampers, and mixing boxes.
   h. Packaged HVAC central-station and zone-type units.
   i. Tanks and pressure vessels.
   j. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
1. Identify mechanical equipment with equipment markers in the following color codes:
   a. Green: For cooling equipment and components.
   b. Yellow: For heating equipment and components.
   c. Green and Yellow, Orange: For combination cooling and heating equipment and components.
   d. Brown: For energy-reclamation equipment and components.
2. Letter Size: Minimum 1/2 inch for name of units if viewing distance is less than 24 inches, 3/4 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
4. Include signs for the following general categories of equipment:
   a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
   b. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
   c. Pumps, compressors, chillers, condensers, and similar motor-driven units.
   d. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
   e. Fans, blowers, primary balancing dampers, and mixing boxes.
   f. Packaged HVAC central-station and zone-type units.
   g. Tanks and pressure vessels.
   h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
1. Pipes with OD, Including Insulation, Less Than 6 Inches: Snap-on application of pretensioned, semi-rigid plastic pipe marker.

2. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with manufacturer's stainless steel bands.
3. Fasten Option: Laminated or bonded application of pipe marker to pipe or insulation.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; in machine rooms; in accessible maintenance spaces such as shafts, tunnels and plenums; and in exterior nonconcealed locations such as rooftops and chiller yards, 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 nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:
1. Green: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
5. Letter Size: Minimum 1/2 inch for name of units if viewing distance is less than 24 inches, 3/4 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system. Reduce intervals to 25 feet in areas of high duct congestion.

3.5 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.7 VALVE TAGS

A. Install on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, plumbing fixture supply stops, shutoff valves, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in valve schedule.

B. Valve Tag Application Schedule: Tag valves according to size, shape, color scheme, and with captions similar to those indicated in the following:

C. Tag Material: Aluminum.

D. Tag Size and Shape: 1-1/2 inches, round.

E. Tag Color: According to the following:
1. Chilled Water: Blue.
2. Cold Water: Black.
3. Hot Water: Red.
4. Fire Protection: Red.
5. Sprinkler: White.
6. Gas: Yellow.
7. Steam: Red.

F. Letter Color: White.

G. Install mounted valve schedule in each major equipment room.

3.8 EQUIPMENT SIGNS AND MARKERS

A. Install engraved plastic-laminate signs or equipment markers on or near each major item of mechanical equipment. Include signs for the following general categories of equipment:
1. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
2. Meters, gages, thermometers, and similar units.
3. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
4. Pumps, compressors, chillers, condensers, and similar motor-driven units.
5. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
6. Fans, blowers, primary balancing dampers, and mixing boxes.
7. Packaged HVAC central-station and zone-type units.
8. Tanks and pressure vessels.
9. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.
10. Any concealed appurtenances requiring access for maintenance shall be clearly identified by sign (to include but not be limited to unions, strainers, valves, etc.).

B. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows showing service and direction of flow.
1. Location: Locate signs near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.9 ADJUSTING AND CLEANING

A. Relocate mechanical identification materials and devices that have become visually blocked by work of this or other Divisions.

B. Clean faces of identification devices and glass frames of valve charts.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work included in this section consists of the furnishing of all labor, instruments, tools, and services required in connection with the testing, adjusting and balancing (TAB) of the heating, ventilating, and air conditioning systems as described in the mechanical specifications and/or shown on the mechanical plans, or reasonable implied therefrom.

B. TAB of the HVAC systems will be performed by an impartial technical firm that is a member of NEBB and whose operations are limited to the field of professional testing and balancing.

C. Mechanical Contractor to obtain TAB services from an independent TAB contractor.

D. Qualified TAB firms shall submit cost, scope of work, qualifications, time line, and references.

E. The TAB firm is responsible to and shall submit five (5) copies of all reports directly to the Architect/Engineer and one copy to the Owner.

F. TAB services shall result in the optimum temperature, airflow, and noise levels in the conditioned space of the project.

G. The following basic components of the HVAC systems shall be tested, adjusted, and balanced:
1. Air distribution systems.
2. Air moving equipment.
3. HVAC pumps (chilled water, hot water, condenser water, etc.).
4. Heating systems (HVAC).
5. Control systems verification.

1.2 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
1. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
3. Measuring electrical performance of HVAC equipment.
4. Setting quantitative performance of HVAC equipment.
5. Verifying that automatic control devices are functioning properly.
6. Measuring sound and vibration.
7. Reporting results of the activities and procedures specified in this Section.

B. Related sections include the following:
1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment. See all related HVAC mechanical sections.
2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

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 design quantities.

C. 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.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. 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.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. 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.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. NEBB: National Environmental Balancing Bureau.

N. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Contract Documents Examination Report: Within 45 days from the Contractor’s Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Contractor’s Notice to Proceed, submit 2 copies of the testing, adjusting and balancing strategies and step-by-step procedures as specified in Part 3 “Preparation” Article below. Include a complete set of report forms intended for use on this Project.

D. Certified Testing, Adjusting and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting and balancing Agent.

E. Sample Report Forms: Submit 2 sets of sample testing, adjusting and balancing report forms.

F. Warranty: Submit 2 copies of special warranty specified in the “Guarantee” Article below.

1.5 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by NEBB.

B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.
   1. Agenda Items: Include at least the following:
      a. Submittal distribution requirements.
      b. Contract Documents examination report.
      c. Testing, adjusting, and balancing 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 Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
   2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

E. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every 12 months or more frequently if required by the instrument manufacturer.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the 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 testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 GUARANTEE

A. General: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2- PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
   1. Contract Documents are defined in the General and Supplementary Conditions of the 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 Architect's and Engineer's 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.

D. 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 the 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.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

F. Examine system and equipment test reports.

G. 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 their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

I. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

K. Examine plenum ceilings, utilized for supply air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

L. Examine strainers for clean screens and proper perforations.

M. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

N. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

O. Examine open-piping-system pumps to ensure absence of entrained air in the suction piping.

P. Examine equipment for installation and for properly operating safety interlocks and controls.

Q. Examine automatic temperature system components to verify the following:
1. Dampers, valves, and other controlled devices operate by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. The 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 2-way valves and 3-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 design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to design values.

R. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing 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 design conditions for system operations can be met.
9. Motors are wired properly with appropriate overloads and correct rotation.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in 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 the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

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 the 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 VARIABLE-AIR-VOLUME SYSTEMS' ADDITIONAL PROCEDURES

A. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
   1. Balance systems similar to constant-volume air systems.
   2. Set terminal units and supply fan at full-airflow condition.

3. Adjust inlet dampers of each terminal unit to design airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan, if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. 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 the outlets balanced for maximum airflow.
8. Measure 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.

3.6 FUNDAMENTAL 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 design 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.

3.7 HYDRONIC SYSTEMS' BALANCING PROCEDURES

A. Determine 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. Verify with the pump manufacturer that this will not damage pump. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on the manufacturer's pump curve at zero flow and confirm that the pump has the intended impeller size.
   2. Check system resistance. With all valves open, read pressure differential across the pump and mark the pump manufacturer's head-capacity curve. Adjust pump discharge valve until design water flow is achieved.
   3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on the 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 design flow.

E. Adjust balancing stations to within specified tolerances of design flow rate as follows:
1. Determine the balancing station with the highest percentage over design flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design 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.

3.8 VARIABLE-FLOW HYDRONIC SYSTEMS' ADDITIONAL PROCEDURES

A. Balance systems with automatic 2- and 3-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.9 PRIMARY-SECONDARY-FLOW HYDRONIC SYSTEMS' ADDITIONAL PROCEDURES

A. Balance the primary system crossover flow first, then balance the secondary system.

3.10 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 if high-efficiency motor.
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.

3.11 BOILERS

A. Measure entering- and leaving-water temperatures and water flow.

3.12 HEAT-TRANSFER COILS

A. Water Coils: Measure the following data for each coil:

1. Entering- and leaving-water temperatures.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperatures of entering and leaving air.
5. Wet-bulb temperatures of entering and leaving air.
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 temperatures at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kW at full load.
6. Fuse or circuit-breaker rating for overload protection.

3.13 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report 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 2 successive 8-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.

3.14 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. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify 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. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.15 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans: -5 to plus 10 percent.
   2. Air Outlets and Inlets: ± 10 percent.
   3. Heating-Water Flow Rate: ± 10 percent.
   4. Cooling-Water Flow Rate: ± 5 percent.

3.16 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, 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.

C. Preliminary Report: Submit preliminary TAB reports to the design engineer for each floor, the central plant, and the chilled and hot water hydronic system.

3.17 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-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 the instruments used for procedures, along with proof of calibration.

C. Final Report Final Report Contents: In addition to the 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 not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
   1. Title page.
   2. Name and address of testing, adjusting and balancing Agent.
   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 testing, adjusting and balancing Agent who certifies the report.
   10. Summary of contents, including the following:
      a. Design versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size and fittings.
13. Notes to explain why certain final data in the body of reports vary from design values.
14. 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. Face and bypass damper settings at coils.
    e. Fan drive settings, including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume, systems.
    g. Settings for supply-air, static-pressure, controller.
    h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:
1. Quantities of outside, supply, return and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Locations of duct traverse(s) of duct layout.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data: Include the following:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches and bore.
    i. Sheave dimension, center-to-center and amount of adjustments in inches (mm).
    j. Number of belts, make and size.
    k. Number of filters, type and size.
2. Motor Data: Include the following:
    a. Make and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches and bore.
    f. Sheave dimensions, center-to-center and amount of adjustments in inches.
3. Test Data: Include design and actual values for the following:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.

G. Apparatus-Coil Test Reports: For apparatus coils, include the following:
1. Coil Data: Include the following:
    a. System Identification.
    b. Location.
    c. Coil type.
    d. Number of rows.

e. Fin spacing in fins per inch.
f. Make and model number.
g. Face area in sq.ft.
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data: Include design and actual values for the following:
a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outside-air, wet and dry-bulb temperatures in deg F.
e. Return-air, wet and dry-bulb temperatures in deg F.
f. Entering-air, wet and dry-bulb temperatures in deg F.
g. Leaving-air, wet and dry bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.

H. Water Chiller Test Reports: For chillers (Air Cooled or Water Cooled)
1. Unit Data: Include the following:
a. Unit Identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
2. Motor Data:
a. Make and frame type and size.
b. Volts, phase and hertz.
c. Full-load amperage and service factor.
3. Test Data:
a. Total chilled water flow rate in gpm.
b. Total condenser water flow rate in gpm.
c. WPD in ft across chilled water.
d. WPD in ft across condenser water.
e. Chilled water supply and return temperatures ˚F.
f. Condenser water supply and return temperatures in ˚F.

I. Cooling Tower Test Reports: For condenser water cooling tower:
1. Unit Data: Include the following:
a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
2. Motor Data (Fan or Pump): Include the following:
a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
3. Test Data: Include design and actual values for the following:
a. Total condenser under flowrate in gpm.
b. Total wpd in ft across condenser water.
c. Condenser water supply and return temperatures in ˚F.
d. Fan rpm.

J. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
   1. Unit Data: Include the following:
      a. System identification.
      b. Location.
      c. Coil identification.
      d. Capacity in Btuh (kW).
      e. Number of stages.
      f. Connected volts, phase, and hertz.
      g. Rated amperage.
      h. Airflow rate in cfm.
      i. Face area in sq. ft.
      j. Minimum face velocity in fpm.
   2. Test Data: Include design and actual values for the following:
      a. Heat output in Btuh.
      b. Airflow rate in cfm.
      c. Air velocity in fpm.
      d. Entering-air temperature in deg F.
      e. Leaving-air temperature in deg F.
      f. Voltage at each connection.
      g. Amperage for each phase.

K. Fan Test Reports: For supply, return, and exhaust fans, include the following:
   1. Fan Data: Include the following:
      a. System identification.
      b. Location.
      c. Make and type.
      d. Model number and size.
      e. Manufacturer's serial number.
      f. Arrangement and class.
      g. Sheave make, size in inches, and bore.
      h. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).
   2. Motor Data: Include the following:
      a. Make and frame type and size.
      b. Horsepower and rpm.
      c. Volts, phase, and hertz.
      d. Full-load amperage and service factor.
      e. Sheave make, size in inches, and bore.
      f. Sheave dimensions, center-to-center and amount of adjustments in inches.
      g. Number of belts, make, and size.
   3. Test Data: Include design and actual values for the following:
      a. Total airflow rate in cfm.
      b. Total system static pressure in inches wg.
      c. Fan rpm.
      d. Discharge static pressure in inches wg.
      e. Suction static pressure in inches wg.

L. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
   1. Report Data: Include the following:
      a. System and air-handling unit number.
      b. Location and zone.
      c. Locate traverse location on duct work layout.
      d. Traverse air temperature in deg F.
      e. Duct static pressure in inches wg.
      f. Duct size in inches.

g. Duct area in sq. ft.
h. Design airflow rate in cfm.
i. Design velocity in fpm.
j. Actual airflow rate in cfm.
k. Actual average velocity in fpm.
l. Barometric pressure in psig.

M. Air-Terminal-Device Reports: For terminal units, include the following:
1. Unit Data: Include the following:
a. System and air-handling unit identification.
b. Location and zone.
c. Test apparatus used.
d. Area served.
e. Air-terminal-device make.
f. Air-terminal-device number from system diagram.
g. Air-terminal-device type and model number.
h. Air-terminal-device size.
i. Air-terminal-device effective area in sq. ft.
2. Test Data: Include design and actual values for the following:
a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

N. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
1. Unit Data: Include the following:
a. System and air-handling unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.
2. Test Data: Include design and actual values for the following:
a. Airflow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

O. Instrument Calibration Reports: For instrument calibration, include the following:
1. Report Data: Include the following:
a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

END OF SECTION

SECTION 23 0719

MECHANICAL 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. Cellular glass.
      b. Flexible elastomeric.
      c. Mineral fiber.
      d. Phenolic
   2. Adhesives.
   3. Mastics.
   4. Sealants.
   5. Factory-applied jackets.
   6. Field-applied fabric-reinforcing mesh.
   7. Field-applied tape.
   8. Field-applied jackets.
   9. Securements.
   10. Corner angles.

B. Related Sections include the following:
   1. Specification Section "Metal Ducts" for duct liners.
   2. Specification Section “Hangers and Supports” for high-density inserts at hangers; **wood inserts at hangers are not acceptable.**
   3. Specification Section “Special Conditions for All Mechanical Work”.
   4. Specification Section “Basic Mechanical Materials and Methods”.

C. Not all items listed within this specification are used. Use only items applicable per application schedule.

1.3 DEFINITIONS

A. ASJ: All-service jacket.

B. CONCEALED: Covered or concealed by a ceiling (gypsum or lay-in acoustical tile) or wall.

C. EXPOSED: Open to view; not concealed by a ceiling or wall of any sort.

D. FSK: Foil, scrim, kraft paper.

E. UNDERFLOOR: Accessible crawl space beneath lowest floor level. (considered “outdoors”)

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). Provide submittal data on all products to be used.

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.

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.

B. All products to be stored in a dry location, protected from the elements. All damaged insulation to be replaced.

1.7 COORDINATION

A. Coordinate size and location of supports, hangers, and high-density insulation inserts and shields specified in Specification Section "Hangers and Supports." Coordinate with drawing details where applicable; wood inserts at hangers are not acceptable.

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 and, where required, after installing and testing heat tracing. 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.

C. Insulation not to be installed until building is dried in.

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 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. Phenolic:
   1. Manufacturers:
      a. Resolco
      b. Dyplast Products
      c. Polyguard
      d. Approved equal.
   2. 100% CFC-free, HCFC-free, and halogen-free, closed cell rigid phenolic foam insulation.
   3. Minimal thermal conductivity @ 75˚ F
      a. Green, 2.5 lb/ft³: 0.15 (Btu.in/hr.ft². F)
      b. Pink, 5.0 lb/ft³: 0.21 (Btu.in/hr.ft². F)

G. Cellular Glass:
   1. Manufacturers:
      a. Pittsburgh Corning Corporation; Foamglas Super K.
   2. Block Insulation: ASTM C 552, Type I.
   3. Special-Shaped Insulation: ASTM C 552, Type III.
   4. Board Insulation: ASTM C 552, Type IV.
   5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
   6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
   7. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Minimal thermal conductivity at 75˚ F of 0.27 (Btu.in/hr.ft². F) (R-value of 10.34@ 3 inches thickness). Factory-applied jacket requirements are specified in Part 2 “Factory-Applied Jackets” Article.

H. Flexible Elastomeric:
   1. Manufacturers:
      a. Aeroflex USA Inc.; Aerocel.
      b. Armacel LLC; AP Armaflex.
   2. Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
   3. Minimal thermal conductivity at 75˚ F of 0.25 (Btu.in/hr.ft². F).

I. Mineral-Fiber Blanket Insulation:

1. Manufacturers:
   a. Johns Manville; Microlite.
   b. Knauf Insulation; Duct Wrap
   c. Owens-Corning; All-Service Duct Wrap.
2. 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 FSP jacket. Factory-applied jacket requirements are specified in Part 2 “Factory-Applied jackets” Article.
3. Minimal density of 1.0 lb/ft³, installed R-value of 6.0 (at 2" thick).

J. Mineral-Fiber Board Insulation:
1. Manufacturers:
   a. Johns Manville; 800 Series Spin-Glas.
   b. Knauf Insulation; Insulation Board.
   c. Owens Corning; Fiberglas 700 Series.
2. Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
3. Minimal density of 2.25 lb/ft³, with a R-value of 8.7 (at 2" thickness).

K. Mineral-Fiber, Preformed Pipe Insulation:
1. Manufacturers:
   a. Johns Manville; Micro-Lok.
   b. Knauf Insulation; 1000° Pipe Insulation.
   c. Owens Corning; Fiberglas Pipe Insulation.
2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Minimum thermal conductivity at 75˚ F of 0.23 (Btu.in/hr.ft². F). 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 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. All products are to contain low V.O.C. as defined/governed by LEED IEQ 4.1 and 4.2 (Regardless of project type).

B. Cellular-Glass, One part, acetoxy cure, silicone adhesive, with a service temperature range of minus 50 to plus 400 deg F.
1. Products:
   a. Foamglas: PC RTV 450 Sillicone Adhesive

C. Flexible Elastomeric: Comply with MIL-A-24179A, Type II, Class I.
1. Products:
   a. K-Flex: 720 LVOC or equal

D. Phenolic: Water based adhesive with a service temp of minus 20°F to 700°F.
1. Products:
   a. Foster 97-15

E. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products:
   a. Design Polymerics, DP2502 (or approved equal).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II. All products are to contain low V.O.C. as defined/governed by LEED IEQ 4.1 and 4.2 (Regardless of project type).

B. Vapor-Barrier Mastic: Water based; suitable for outdoor use on below ambient services, or indoor vapor barrier use.
   1. Products:
      a. Childers Products, Division of ITW; CP-35.
   2. Water-Vapor Permeance: ASTM F 1249, 0.09 perm at 55-mils film thickness.
   3. Service Temperature Range: Minus 20 to plus 190 deg F.
   4. Solids Content: ASTM D 1644, 60 percent by volume and 73 percent by weight.
   5. Color: White.
   6. VOC: 36 g/l

2.5 SEALANTS

A. Joint Sealants:
   1. Joint Sealants for Cellular-Glass Products:
      a. Pittsburgh Corning Corporation; Pittseal 444N.
   2. Joint Sealant for Phenolic Products
      a. Foster 95-50

B. Metal Jacket:
   1. Products:
      a. Foster 95-44 or equal.
      b. Childers Products, Division of ITW; CP-76.

C. Mineral Fiber:
   1. Design Polymerics DP 2502.
   2. Childers Products, Division of ITW; CP-35.

D. PVC Jacket:
   1. Childers Products, Division of ITW; CP-35.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 2.2 oz./sq. yd. 10 x 10 strand count per square inch, minimum 4" wide band.
   1. Available Products:
      a. Chil-glas #10.
      b. Charles Harmon and Co. white weaveset.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, 25/50 ASTM-F 84, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Products:
      a. Johns Manville; Zeston.
      b. Proto PVC Corporation; LoSmoke.
   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.

C. Metal Jacket:
   1. Products:
      a. Childers Products, Division of ITW; Metal Jacketing Systems.
   2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.
      a. Factory cut and rolled to size.
      b. Finish and thickness are indicated in field-applied jacket schedules.

2.9 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: 4 inches.
   2. Thickness: 14.0 mils.
   3. Adhesion: 73 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 55 lbf/inch in width.
   6. Color: White

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: 4 inches.
   2. Thickness: 13 mils.
   3. Adhesion: 73 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. Color: Silver

2.10 SECUREMENTS

A. Bands:
   1. Products:
      a. Childers Products; Bands.
   2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 316; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
   3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch with wing or closed seal.

4. 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. Cupped-Head, Capacitor-Discharge-Insulated Weld Pins: Zinc-coated steel pin, fully annealed for capacitor-discharge welding, 12 Gauge shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer. **Contractor to field verify, integrity of pin weld on ductwork with sheet metal thickness less than 22-gauge. Integrity to be verified prior to concealment with insulation.**
a. Products:
1) GEMCO; Cupped Head Weld Pin or equal.
2. Metal, “Peel and Press” Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
a. Products:
1) GEMCO; Peel and Press or equal.
b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 12 Gauge diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
3. Insulation-Retaining Washers and Cap: Self-locking cap washers formed from 12 Gauge, 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. Products:
1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.11 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.

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. For Stainless Steel; apply a corrosion coating to insulated surfaces with an epoxy primer and an epoxy finish 5 mils thick.

B. Verify and coordinate insulation installation with the systems and trades installing heat tracing. Comply with requirements for heat tracing that applies to insulation.

3.3 COMMON INSTALLATION REQUIREMENTS

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. 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.

C. 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.

D. 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.

E. Install high-density inserts at hanger locations prior to insulating (duct and pipe); wood or block inserts are not acceptable.

F. Install insulation with longitudinal seams at top and bottom of horizontal runs.

G. Where multiple layers of insulation are required, longitudinal and end seams are to be staggered.

H. Do not weld brackets, clips, pins or other attachment devices to piping, fittings, tanks, coils, equipment, vessel, and specialties.

I. Keep insulation materials clean and dry before, during application, and finishing.

J. Install insulation with tight longitudinal seams and end joints.

K. Install insulation with least number of joints practical.

L. Install insulation so that material is not over compressed. Install corner angles prior to insulating; to protect all insulation from damage.

M. Seal all joints, and seams, including penetrations in insulation, at supports, and other projections with insulation of same material overlapped by 2”. Secure strips with outward clinching staples along edge of overlap, (spaced 1 inch on center) and seal entire joint or seam with mastic and embedded fiberglass reinforcing mesh, minimum 4", cover mesh with finish coat of mastic.

N. Do not insulate, conceal, or enclose pipe hangers, channel and steel supports, etc. not directly fasten to duct.

O. 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.

P. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses. Do not water down products unless directed by manufacture. Use clean potable demineralized water when required.

Q. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

R. Repair all damage insulation prior to concealment as noted above.

S. Do not insulate or conceal vibration-control devices, labels, stamps, nameplates, data plates, manholes, cleanouts, etc. require for maintenances.

T. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarded integrity, unless otherwise indicated.

U. Insulate pipe elbows, tees, valves, strainers, flanges, etc., using preformed fitting insulation, mitered fittings or oversized preformed pipe insulation made from same material thickness and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. 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, voids, and irregular surfaces with insulating mastic finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation. Provide a removable reusable insulation cover; design that maintains vapor barrier. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts.

V. Cover segmented insulated surfaces with a layer of finishing adhesive and coat with a vapor-barrier mastic. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

W. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Secure PVC covers to adjoining insulation facing using staples and ASJ tape. Seal PVC fitting covers with mastic.

X. 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 adhesive and finish with mastic. All connections are to be accessible.

Y. Install removable insulation segment and covers at flanges, valves, controls, unions, equipment access doors, manholes, hand holes, and other elements that require frequent removal for service and inspection. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.4 PENETRATIONS

A. Install insulation continuously through all walls, floors, and partitions penetrations and sleeves.

B. Extend jacket of outdoor installation into wall and roof jacks by 2 inches. Seal jacket to roof flashing with approved flashing sealant.

C. Insulation Installation at Fire-Rated Walls, floors and Partitions Penetrations for duct work where fire/smoke dampers are required: Terminate insulation at fire damper sleeves as

require by damper manufacturer. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

3.5 GENERAL PIPE INSULATION INSTALLATION (IN ADDITION TO COMMON REQUIREMENTS)

A. Preformed Pipe Insulation Installation on Pipe, Fittings, Valves, Flanges, Tanks, Elbows, and Appurtenances for Cellular- Glass, Mineral- Fiber, Flexible Elastomeric, and Phenolic insulations:
   1. Install insulation in a manner that secures material to system being insulated with staples, tape and mastic.
   2. When insulation with preformed pipe insulation, seal all longitudinal seams, end joints, and protrusions with manufacturers recommended tape matching jacket, vapor-barrier mastic, joint sealant, and adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
   3. Secure fittings, jacket, cover, etc. with tape matching jacket and secure with outward clinched staples 1 inch on center. Apply vapor-barrier mastic over staples.
   4. Arrange insulation to permit access to valves packing, flanges, unions, etc. and valve operation for maintenance without disturbing insulation. Install insulation so that it can be removed without damage to surrounding insulation or access enclosure.
   5. Pipe hangers are not to be concealed in insulation.
   6. Seal all exposed insulation ends with mastic.
   7. Seal all mitered joints prior to installing covers with vapor-barrier sealant and mastic.
   8. Install preformed pipe insulation to outer diameter of pipe flange.
   9. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   10. Fill voids between inner circumference of valves, flange, elbows, and bolts insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
   11. Install preformed sections of same material insulation when available. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Install PVC cover over fitting or mitered section.
   12. Arrange insulation to permit access to valves packing, flanges, unions, etc. and valve operation for maintenance without disturbing insulation. Install insulation so that it can be removed without damage to surrounding insulation or access enclosure.

3.6 GENERAL BLANKET AND BOARD INSULATION INSTALLATION (IN ADDITION TO COMMON REQUIREMENTS)

A. Blanket and Board Insulation Installation on Duct, Tanks, Vessels, Elbows, and Appurtenances:
   1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for a minimum of 50 percent coverage of duct and plenum and 100 percent coverage of equipment, tanks, etc.; to secure insulation to surfaces. Apply adhesive to entire circumference of all surfaces; including fittings and transitions.
   2. Install cupped-head, capacitor-discharge-weld pins surfaces to secure insulation to ductwork. Install on sides and bottom of horizontal and vertical ducts having a width or height greater than 23 inches. Locate 16 inches center and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface as required by manufacturer recommendation. Use approved adhesive stick anchor pins with washers for all equipment, tanks, etc. Cut excess portion of stick anchor pins and install washer’s caps. Cover exposed pins and washers caps with tape and mastic matching insulation facing.
   3. Install PVC corner angles prior to installing blanket insulation.

4. Do not over compress insulation during installation. Cover exposed pins and washers with tape matching insulation facing and mastic.
5. Install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 3/4-inch outward-clinching staples, 1 inch on center. Coat all seams/joints with mastic and embed with fiberglass reinforced mesh, minimum 4", cover mesh with finish coat of mastic.
6. Repair punctures, tears, penetrations and protrusions with 6-inch-wide strips of same material used to insulate duct. Seal all seams with staples, cover with mastic and cover with embedded fiberglass reinforced mesh, cover mesh with finish coat of mastic.
7. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
8. 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.
9. Insulate hangers attached to duct work. Do not insulate or enclose channel, supports, etc. not directly fasten to duct.
10. Insulation termination: Butt insulation up to termination point. Apply mastic no less than 3" overlap on insulation, and 3" on metal surface. Embed fiberglass reinforced mesh overlapping full 3" of termination point, 6" strip. Cover mesh with finish coat of mastic.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. 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. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge. Secure metal jacket with stainless-steel bands 12 inches on center and at end joints.

3.8 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.
   1. Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer’s recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Inspect insulated duct, pipe, and equipment, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two (3) location(s) for each system.
2. All insulation applications will be considered defective work if sample inspection reveals noncompliance with requirements.
3. Remove all defective work and install new insulation and jackets to replace insulation and jackets removed for inspection. Repeat inspection procedures as needed.

3.10 INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:
1. Indoor, concealed/exposed supply, return, relief and outdoor air.
2. Outdoor, concealed/exposed supply, return and relief air.

B. Piping Requiring Insulation:
1. Indoor and outdoor hydronics.
2. All pipe and appurtenances that are susceptible to sweating.
3. All pipe and appurtenances carrying water or refrigerant, for space conditioning.
4. Any piping not specifically scheduled for insulation below to be insulated with the code minimum required insulation.

C. Items Not Insulated:
1. Fibrous-glass ducts.
2. Double-wall metal ducts or lined metal ducts, both with sufficient insulation thickness to comply with adopted edition of IECC and ASHRAE/ IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.
8. General building exhaust duct.

3.11 DUCT AND PLENUM INSULATION SCHEDULE

A. Indoor, concealed, all duct insulation shall be of the following (Including dishwasher exhaust):
1. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.

B. Indoor, exposed (including mechanical rooms and utility rooms), rectangular, all duct insulation shall be of the following:
1. Mineral-Fiber Board: 2 inches thick and 2.25-lb/cu. ft. nominal density.

C. Indoor, exposed round or flat oval ductwork shall be double-wall construction.

D. Outdoor (including underfloor), all duct insulation shall be any of the following:
1. Rectangular Duct: Cellular Glass, 3 inches thick and 7.5-lb/cu. ft. nominal density. (minimum R-value of 8)
2. Round/Flat Oval: Double wall construction (reference Metal Ducts Specification).

3.12 AIR DEVICE INSULATION SCHEDULE

A. Supply-air devices (all styles/sizes): Field insulate backside of all devices that are not factory lined:
1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density. Secured to air device with FSK tape, all sides.

3.13 EQUIPMENT INSULATION SCHEDULE

A. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

B. Expansion/compression/buffer tanks, Air-separators, filter feeders, etc. insulation shall be any of the following:
1. Cellular Glass: 3 inches. (chilled water service)
2. Phenolic: 2 inches. (chilled water service)
3. Mineral Fiber Board: 3 inches. (hot water service)

C. Steam-to-hot water heat exchanger insulation:
1. Mineral-Fiber board: 3” thick, 3lb/cu. ft. density.
2. Cellular Glass: 3" thick, 7.5 lb/cu. ft density.

3.14 PIPING INSULATION SCHEDULE

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

B. Condensate and Equipment Drains:
1. All Pipe Sizes: Insulation shall be any of the following:
a. Flexible Elastomeric: 1 inch thick.

C. Chilled Water Supply and Return:
1. All Pipe Sizes: Insulation shall be any of the following:
a. Pre-insulated Pipe: Reference Hydronic Piping Specification (for use underfloor, buried, and outdoors).
b. Cellular Glass: (for use indoors and outdoors, not accepted in underfloor or buried). Reference schedule below for thickness.
c. Phenolic: (for use indoors and outdoors, not accepted in underfloor or buried). Reference schedule below for thickness.

D. Hot Water Supply and Return:
1. All pipe sizes:
a. Mineral-Fiber (for use indoors) Reference table below for thickness.
b. Pre-insulated Pipe: Reference Hydronic Piping Specification (for use underfloor and outdoors). Reference table below for thickness.
c. Phenolic: (for use indoors and outdoors, not accepted in underfloor or buried) Reference Schedule below for thickness.
d. Cellular Glass: (for use indoors and outdoors, not accepted in underfloor or buried) Reference Schedule below for thickness.

E. Phenolic Density Schedule:
1. Indoors Concealed: 2.5 lb/ft.^{3} (Green)
2. Indoors Exposed: 5 lb/ft.^{3} (Pink)
3. Outdoors: 5 lb/ft.^{3} (Pink)

F. Steam and Steam Condensate, 350˚ F and below:
1. All pipe sizes:
a. Mineral-Fiber, Preformed pipe, Type I: 3" thick.

Insulation Thickness Schedule

Fluid	≤1.5” Pipe Size					>1.5” Pipe Size				
	Cellular Glass	Phenolic	Pre-Insulated	Mineral Fiber	Flex Elastomeric	Cellular Glass	Phenolic	Pre-Insulated	Mineral Fiber	Flex Elastomeric

Chilled Water	2”	1.5”	1.5”	N/A	N/A	2”	1.5”	1.5”	N/A	N/A
Hot Water	2”	1.5”	1.5”	1.5”	N/A	2.5”	2”	2”	2”	N/A
Steam/ Condensate	N/A	N/A	N/A	3”	N/A	N/A	N/A	N/A	3”	N/A
Condensate	N/A	N/A	N/A	N/A	1”	N/A	N/A	N/A	N/A	1”
Refrigerant Suction/Hot Gas Piping	N/A	N/A	N/A	N/A	1.5”	N/A	N/A	N/A	N/A	1”

G. Refrigerant Suction and Hot Gas Piping:
   1. All pipe sizes: Insulation shall be the following:
      a. Flexible elastomeric: 1-½ inch thick.

3.15 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. Ducts/Piping exposed in finished indoor areas, outdoors, underfloor and mechanical rooms.
   1. Aluminum, Stucco Embossed: 0.016 inch thick.

C. Indoor hydronic piping fitting or elbows.
   1. PVC: 0.015 inch thick.

END OF SECTION

SECTION 23 2300

REFRIGERANT 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 refrigerant piping used for air-conditioning applications.

B. Related Sections include the following:
   1. Specification Section "Hangers and Supports" for pipe supports and installation requirements.
   2. Specification Section "Mechanical Identification" for labeling and identifying refrigerant piping.

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.
   1. Refrigerant piping indicated is schematic only. Size piping and design the actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and compliance with warranties of connected equipment.

1.4 QUALITY ASSURANCE

A. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."

C. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

1.5 COORDINATION

A. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

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. Refrigerants:
      a. Allied Signal, Inc./Fluorine Products; Genetron Refrigerants.
      b. DuPont Company; Fluorochemicals Div.
      c. Elf Atochem North America, Inc.; Fluorocarbon Div.
      d. ICI Americas Inc./ICI KLEA; Fluorochemicals Bus.
   2. Refrigerant Valves and Specialties:
      a. Climate & Industrial Controls Group; Parker-Hannifin Corp.; Refrigeration & Air Conditioning Division.
      b. Danfoss Electronics, Inc.
      c. Emerson Electric Company; Alco Controls Div.
      d. Henry Valve Company.
      e. Sporlan Valve Company.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B 280, Type ACR

B. Annealed-Temper Copper Tube: ASTM B 280, Type ACR

C. Wrought-Copper Fittings: ASME B16.22.

D. Wrought-Copper Unions: ASME B16.22.

E. Bronze Filler Metals: AWS A5.8, Classification BAg-1 (silver)

2.3 REFRIGERANT PIPING SPECIALITIES

A. Straight- or Angle-Type Strainers: 500-psig working pressure; forged-brass or steel body with stainless-steel wire or brass-reinforced Monel screen of 80 to 100 mesh in liquid lines up to 1-1/8 inches, 60 mesh in larger liquid lines, and 40 mesh in suction lines; with screwed cleanout plug and solder-end connections.

B. Moisture/Liquid Indicators: 500-psig maximum working pressure and 200 deg F operating temperature; all-brass body with replaceable, polished, optical viewing window with color-coded moisture indicator; with solder-end connections.

2.4 REFRIGERANTS

A. ASHRAE 34, R-134a: Tetrafluoroethane.

B. ASHRAE 34, R-410a: Difluoromethane/Pentafluoroethane blend.

PART 3 – EXECUTION

3.1 PIPING APPLICATIONS

A. Aboveground, within Building: Type ACR drawn-copper tubing

3.2 SPECIALTY APPLICATIONS

A. Install liquid indicator upstream of filter-dryer in liquid line leaving condenser.

B. Install permanent filter-dryers in systems using hermetic compressors.

C. Install moister-liquid indicators in liquid lines between filter-dryers and fan/coil units.

D. Install strainers immediately upstream from each automatic valve, including expansion valves, solenoid valves, hot-gas bypass valves.

3.3 PIPING INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Basic piping installation requirements are specified in Specification Section "Basic Mechanical Materials and Methods."

C. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

D. Where traps are not required by the equipment manufacturer, all offsets shall use 45 degree fittings and have a minimum 3:1 length to offset ratio.

E. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

F. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

G. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
   2. Install horizontal suction lines with a uniform slope downward to compressor.
   3. Install traps and double risers to entrain oil in vertical runs.
   4. Liquid lines may be installed level.
   5. Install bypass around moisture-liquid indicators in lines larger than NPS 2.
   6. Install unions to allow removal of solenoid valves, press-regulating valves, and expansion valves and at connections to compressors and evaporators.

I. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

J. Hanger, support, and anchor products are specified in Specification Section "Hangers and Supports."

K. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs, 20 feet or longer.
3. Pipe rollers for multiple horizontal runs 20 feet or longer, supported by a trapeze.
4. Spring hangers to support vertical runs.

L. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

M. Support vertical runs at each floor.

3.4 PIPE JOINT CONSTRUCTION

A. Braze joints according to Specification Section "Basic Mechanical Materials and Methods."

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

3.5 FIELD QUALITY CONTROL

A. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.
1. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.
2. Test high- and low-pressure side piping of each system at not less than the lower of the design pressure or the setting of pressure relief device protecting high and low side of system.
3. System shall maintain test pressure at the manifold gage throughout duration of test.
4. Test joints and fittings by brushing a small amount of soap and glycerin solution over joint.
5. Fill system with nitrogen to raise a test pressure of 150 psig or higher as required by authorities having jurisdiction.
6. Remake leaking joints using new materials and retest until satisfactory results are achieved.

3.6 ADJUSTING

A. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
1. Check compressor oil level above center of sight glass.
2. Open compressor suction and discharge valves.
3. Open refrigerant valves, except bypass valves that are used for other purposes.
4. Check compressor-motor alignment, and lubricate motors and bearings.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:
1. Install permanent-type filter-dryer after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to a vacuum of 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new permanent-type filter-dryer in charging line. Provide full-operating charge.

END OF SECTION

SECTION 23 3113

METAL DUCTS

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. Single-wall rectangular ducts and fittings.
2. Double-wall rectangular ducts and fittings.
3. Single-wall round and flat-oval ducts and fittings.
4. Double-wall round and flat-oval ducts and fittings.
5. Sheet metal materials.
6. Duct liner.
7. Sealants and gaskets.
8. Hangers and supports.
9. Ductwork Handling and Plenum Protection.
10. Ductwork Cleaning

B. Related Sections:
1. Mechanical Specification Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.
2. Mechanical Specification Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
3. Mechanical Specification Section “Hangers & Supports”.
4. Mechanical Specification Section “Basic Mechanical Materials and Methods”.
5. Mechanical Specification Section “Special Conditions for Mechanical Work”.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated.
1. Static-Pressure Classes: Variable Volume Systems
a. Supply Ducts: (Upstream from Air Terminal Units): 3-inch wg.
b. Supply Ducts (Downstream from Air Terminal Units): 1-inch wg.
c. Return Ducts (Negative Pressure): 1-inch wg.
d. Outside Air Ducts (Negative Pressure): 1-inch wg.
2. Static-Pressure Classes: Constant Volume Systems
a. Supply Ducts: 2-inch wg.
b. Return Ducts (Negative Pressure): 1-inch wg.
c. Outside Air Ducts (Negative Pressure): 1-inch wg.
3. Static-Pressure Classes: Other Systems
a. Fume Hood Exhaust (negative Pressure): 3-inch wg.
b. General Exhaust (Negative Pressure): 1-inch wg.
c. Relief Air: 1-inch wg.

4. Leakage Class:
   a. Round Supply-Air Duct: 3 cfm/100 sq. ft. at static pressure class.
   b. Flat-Oval Supply-Air Duct: 3 cfm/100 sq. ft. at static pressure class.
   c. Rectangular Supply-Air Duct: 6 cfm/100 sq. ft. at static pressure class.
   d. Flexible Supply-Air Duct: 6 cfm/100 sq. ft. at static pressure class.

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."

1.4 DEFINITIONS

A. Exposed: Open to view; not concealed by a ceiling.
   1. Includes mechanical rooms.
   2. Includes outdoors.
   3. Includes crawlspace.

B. Concealed: Covered or Concealed by a ceiling, solid inaccessible or lay-in acoustical tile.

1.5 SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives.
   2. Sealants and gaskets.
   3. Insulation.
   4. Metal.
   5. Fasteners.
   6. Hangers.
   7. Double Wall Ductwork (Round or Flat Oval).
   8. Single Wall (Round or Flat Oval).

B. Shop Drawings/Coordination Drawings: CADD generated, ¼" scale. Show fabrication and installation details for metal ducts.
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Factory- and shop-fabricated ducts and fittings.
   3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
   4. Elevation of top of ducts.
   5. Dimensions of main duct runs from building grid lines.
   6. Fittings.
   7. Reinforcement and spacing.
   8. Seam and joint construction.
   9. Penetrations through fire-rated and other partitions.
   10. Equipment installation based on equipment being used on Project.
   11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   12. Hangers and supports, including methods for duct and building attachment, and vibration isolation (where applicable).
   13. Ceiling suspension assembly members.
   14. Other systems installed in same space as ducts, including fire sprinkler piping; electrical conduits; cable trays; hydronic, domestic, and sanitary piping; and structural members.
   15. Ceiling-and-wall-mounting access doors and panels required to provide access to dampers and other operating devices.

16. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Welding certificates.

D. Field quality-control reports.

E. Field Pressure test Reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

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. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Seal all duct transverse joints, longitudinal seams, flanges, and duct wall penetrations (SMACNA Seal Class-A regardless of static pressure construction class).

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

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. McGill Airflow LLC.

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.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. 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 at 75 deg F mean temperature.
2. Thickness:
a. 1 inch, minimum for INDOOR, exposed ducts in conditioned spaces.
b. 1-1/2 inches, minimum for INDOOR ducts in unconditioned spaces, including, but not limited to return-air plenums and mechanical rooms.
c. 2-1/2 inches, minimum for OUTDOOR ducts.
3. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
4. Coat insulation with antimicrobial coating.

G. Formed-on Transverse Joints (Flanges): Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Traverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

H. Seal all duct transverse joints, longitudinal seams, flanges and duct wall penetrations (SMACNA Seal Class-A regardless of static pressure construction class).

2.3 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: **Spiral seams** complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class. **Longitudinal-seams (snap-lock) are not acceptable for any application.**
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. Lindab Inc.
b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Spiral Pipe of Texas

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter (diameter of the round sides connecting the flat portions of the duct).

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, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

D. Seams: Fabricate according to the **spiral seam requirements** of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." **Longitudinal-seams (snap-lock) are not acceptable for any application, except where indicated below.**
   1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
   2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

E. 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."

F. Seal all duct transverse joints, longitudinal seams, flanges and duct wall penetrations (SMACNA Seal Class-A regardless of static pressure construction class).

2.4 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

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. Lindab Inc.
   2. McGill AirFlow LLC.
   3. SEMCO Incorporated.
   4. Spiral Pipe of Texas

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter (diameter of the round sides connecting the flat portions of the duct) of the inner duct.

C. Outer Duct Fabrication Requirements: **Spiral seams** complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class. **Longitudinal-seams (snap-lock) are not acceptable for any application.**
   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 60 Inches in Diameter: Flanged.
   2. Seams: Fabricate according to the **spiral seam requirements** of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," 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." **Longitudinal-seams (snap-lock) are not acceptable for any application, except where indicated below.**
      a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
      b. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
   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."

D. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch-diameter perforations, with overall open area of 23 percent.

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 at 75 deg F mean temperature.
   2. Thickness:
      a. 1 inch, minimum for INDOOR, exposed ducts in conditioned spaces.
      b. 1-1/2 inches, minimum for INDOOR ducts in unconditioned spaces, including, but not limited to return-air plenums and mechanical rooms.
      c. 2-1/2 inches, minimum for OUTDOOR ducts.
   3. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
   4. Coat insulation with antimicrobial coating.
   5. 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, rust, stains, discolorations, and other imperfections. All ductwork shall be a minimum of 24 gage, with a minimum thickness of 0.023 inches. Where in the SMACNA “HVAC Duct Construction Standards-Metal Flexible” it is indicated that a lighter gage to a minimum of 24 gage.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G60 (Z180).
   2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G60 (Z180).
   2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils thick on sheet metal surface of ducts and fittings exposed to corrosive conditions, and minimum 4 mils thick on opposite surface.
   3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.

D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

E. 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.

F. 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.

G. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

H. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

I. Plastic Connectors are not acceptable.

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.
      e. Maximum Thermal Conductivity:
         1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
         2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
   2. 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.
   3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916. Equal to DP 2502.

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- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer. Equal to CS-10.

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. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

7. 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 or where indicated.
8. 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. All products are to contain low V.O.C. as defined/governed by LEED IEQ 4.1 and 4.2 (Regardless of project type).

B. Water-Based Joint and Seam Sealant (for indoor installation):
   1. Application Method: Brush on.
   2. Solids Content: Minimum 68 percent.
   3. Water resistant.
   4. Mold and mildew resistant.
   5. VOC: less than 30 g/l (less water).
   6. Maximum Static-Pressure Class: 15-inch wg, positive and negative.
   7. Service: Indoor.
   8. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
   9. DP 1020 or approved equal.

C. Water-Based Joint and Seam Sealant (for outdoor installation):
   1. Application Method: Tube application or dry tooling.
   2. Service Temp Range (degrees F): -40 to 180.
   3. Water resistant.
   4. Mold and mildew resistant.
   5. Service: Indoor.
   6. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
   7. Sonolastic NP-1 or approved equal.

D. Flanged Joint Sealant: Comply with ASTM E-84.
   1. General: Butyl gasket tape.
   2. Type: Butyl Rubber.
   3. Service Temperature: Minus 40°F to 245°F
   4. Pressure Class: All
   5. DP 1040

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. All ductwork sizes indicted on drawings are internal, free area dimensions. 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".

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. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

H. Coordinate layout with suspended ceiling, fire-and smoke-control dampers, lighting layouts, and similar finished work.

I. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws. Sealant of seems/joints to include (but not limited to): all joints (including gasketed joints) metal seams, taps, any connections, etc.

J. Paint interiors of metal ducts that do not have duct liner, for 24 inches (600 mm) upstream of return air registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

K. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

L. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness. Compression of insulation by other trades (pipe, conduit, etc) is not acceptable.

M. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

N. 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.

O. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Mechanical Specification Section "Air Duct Accessories" for fire and smoke dampers.

P. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

Q. Horizontal ductwork in mechanical rooms must be installed a minimum of 8’-0” AFF.

R. All duct floor penetrations must have a water-tight, continuous concrete curb surrounding them. Minimum curb size shall be 3-1/2” tall X 3-1/2” wide.

3.2 DUCTWORK HANDLING AND PLENUM PROTECTION

A. All ductwork shall be delivered to site and stored with all openings protected from the elements. Protection to include 2.5 mil thick polyethylene plastic film secured with tape or integral elastic band.

B. Each segment/section of ductwork installed is to be appropriately protected from elements.

C. Any ductwork damaged during delivery, installation, or at any time during construction will be removed from job and replaced.

D. Ductwork found onsite (installed or stored) without approved protection will be removed from job and replaced.

E. Ductwork installed exposed to the elements to be sealed (joints and seems) immediately after installation. Any ductwork not sealed is susceptible to rejection and removed from job.

F. Under no circumstances shall insulation be applied to ductwork prior to the building being fully dried in (i.e.: building sealed, windows and roof installed, etc). Any ductwork being insulated prior to building dry-in is susceptible to rejections and removed from job.

G. If ductwork is found onsite not protected or the newly installed ductwork is deemed as dirty, engineer can elect for the contractor to clean all duct at no cost to the owner per NADCA 1992.

3.3 SEAM AND JOINT SEALINGS

A. Seal all duct transverse joints, longitudinal seams, flanges and duct wall penetrations (SMACNA Seal Class-A regardless of static pressure construction class).

3.4 HANGERS AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Chapter 4 "Hangers and Supports," unless otherwise indicated.
   1. Support ducts greater than 36 inches with width with trapeze threaded rod and angle or channel supports. Straps not acceptable.
   2. Hangers Exposed to View: Threaded rod and channel supports (do not use steel angles).

B. Building Attachments: Concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," Table4-1 (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 of each elbow and within 48 inches of each branch intersection. Elbows 36" and larger to be individually supported.

D. 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.

E. 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.
   1. Do not attach hangers to metal deck roof assemblies with built-up insulation only (no concrete). Attach only to structural steel members.

F. Support vertical ducts at maximum intervals of 16 feet and at each floor.

3.5 CONNECTIONS

A. Make all connections to all fan-bearing equipment with flexible connectors complying with Specification Section "Air Duct Accessories".

B. Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible" for branch, outlet and inlet, and terminal unit connections. Reference detail for specific additional items required.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:
   1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Leakage Class defined in previous sections of specification. Amount of ductwork to be tested to be determined by Engineer or Field Inspector).
   2. Test the following systems:
      a. Medium Pressure Ductwork (3-Inch wg), up to Air Terminal (branch taps included): Test representative duct sections totaling no less than 100 percent of total installed duct area.
      b. Low Pressure Supply Ducts: Test representative duct totaling no less than 20 percent of total installed duct area.
      c. Return Ducts: Test representative duct sections totaling no less than 20 percent of total installed duct area.
      d. Exhaust Ducts: Test representative duct sections totaling no less than 20 percent of total installed duct area.
      e. Outdoor Air Ducts: Test representative duct sections totaling no less than 20 percent of total installed duct area.
      f. Grease Laden/Dishwasher Exhaust: Test representative duct sections per IMC "Light Test."
   3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
   4. Test for leaks before insulation application.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Contractor to disassemble, reassemble and seal segments of systems to accommodate leakage testing and for compliance with test requirements / leakage rates.

E. All testing equipment to be calibrated (by manufacturer) within 3 years of onsite duct pressure testing. Documentation to be provided for verification of certification to Engineer through submittal process.

F. Test Coupons: Cut out three (3) 4x4" test coupons in random locations selected by the design engineer for verification of gage thickness. Coupons shall be taken at the time of pressure testing.

G. Prepare test and inspection reports.

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as follows:
   1. Acid-Resistant (Fume-Handling) Ducts:
      a. Type 304, stainless-steel sheet – welded.
      b. Exposed to View: No. 4 finish.
      c. Concealed: No. 2D finish.
   2. Moist Environment Ducts: Aluminum.
   3. Spaces with pools, spas, hot tubs or water features: Aluminum.
   4. Kitchen Exhaust – Reference applicable specification.

B. Intermediate Reinforcement:
   1. Galvanized-Steel Ducts: Galvanized steel.
   2. Stainless-Steel Ducts: Galvanized steel.
   3. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.

C. Liner:
   1. Transfer Ducts: Fibrous glass, Type I 1 inch thick.

D. Double-Wall Duct Schedule:
   1. All exposed Round/Flat Oval Ductwork.

E. Elbow Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Figure 2-2, "Rectangular Elbows".
      a. Velocity 1000 fpm or Lower:
         1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
         2) Mitered Type RE 4 without vanes.
      b. Velocity 1000 to 1500 fpm:
         1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
         2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
         3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support Elbows."
      c. Velocity 1500 fpm (7.6 m/s) or Higher:
         1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
         2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
         3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows.
   2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Figure 3-3, "Round Duct Elbows".
      a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
         1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
         2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
         3) Velocity 1500 fpm or higher: 1.5 radius-to-diameter and five segments for 90-degree elbow.
      b. Round Elbows, 12 inches and smaller diameter: Stamped or pleated.
      c. Round Elbows, 14 inches and larger in diameter: Welded.

F. Branch Configuration
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," Figure 2-6, "Branch Connections."
      a. Rectangular Main to Rectangular Branch: 45-degree entry.
      b. Rectangular Main to Round Branch: Side takeoff fitting.
   2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
      a. Velocity 1000 fpm or Lower: 90-degree tap.
      b. Velocity 1000 to 1500 fpm: Conical tap.
      c. Velocity 1500 fpm or higher: 45-degree lateral.

3.9 CLEANING NEW SYSTEMS

A. If ductwork is found onsite not protected or the newly installed ductwork is deemed as dirty, engineer can elect for the contractor to clean all duct at no cost to the owner per NADCA 1992.

B. System Cleaning: (If required)
   1. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.
   2. Provide service openings (approved duct access doors), as required, for physical and mechanical entry during cleaning and for inspection. All duct access doors to be installed prior to any duct pressure tests.
      a. Removed and reinstall ceiling sections to gain access during the cleaning process.
   3. Vent vacuuming system to the outside. Include filtration to conation debris removed from HVAC systems, and locate exhaust down wind and minimum of 20 feet away from air intakes and other points of entry into building.
   4. Clean the following metal duct systems by removing surface contaminants and deposits:
      a. Air outlets and inlets (registers, grilles and diffusers).
      b. Supply, return and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers and drive assemblies.
      c. Air-handling unit internal surfaces and components including mixing box, coil section, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
      d. Coils and related components.
      e. Return-air ducts, dampers and actuators except in ceiling plenums and mechanical equipment rooms.
      f. Supply-air ducts, dampers, actuators and turning vanes.
   5. Mechanical Cleaning Methodology:
      a. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
      b. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
      c. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner or duct accessories.
      d. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do no permit duct liner to get wet.
      e. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
   6. Cleanliness Verification:
      a. Visually inspect metal ducts for contaminants.
      b. Where contaminants are discovered, re-clean and re-inspect ducts.

END OF SECTION

SECTION 23 3300

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. Manual-volume dampers.
3. Fire dampers
4. Fire and smoke dampers.
5. Turning vanes.
6. Duct-mounted access doors and panels.
7. Flexible ducts.
8. Flexible connectors.
9. Side takeoff fittings.
10. Duct accessory hardware.
11. Motorized control dampers.

B. Related Sections include the following:
1. Specification Section "Access Doors" for wall- and ceiling-mounted access doors and panels.
2. Specification Section "Louvers and Vents" for intake and relief louvers and vents connected to ducts and installed in exterior walls.
3. Specification Section "Air Terminals" for constant-volume and variable-air-volume control boxes, and reheat boxes.
4. Specification Section "Air Inlets and Outlets."
5. Specification Section "HVAC Controls" for electric damper actuators.

1.3 SUBMITTALS

A. Product Data: For the following:
1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Fire and smoke dampers.
5. Duct-mounted access doors and panels.
6. Flexible ducts.
7. Motorized control dampers.
8. Side takeoff fittings

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

2. 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, are packaged with protective covering for storage, and are identified with labels describing contents.
1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.063-inch thick extruded aluminum, with mounting flange.

C. Blades: 0.050-inch thick aluminum sheet.

D. Blade Seals: Felt.

E. Blade Axles: Nonferrous.

F. Tie Bars and Brackets: Aluminum.

G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

A. General: 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 Classifications of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Standard Volume Dampers: Multiple- or single-blade, opposed-blade design, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
1. Roll-Formed Steel Blades: 0.064-inch thick, galvanized, sheet steel.
2. Blade Axles: Galvanized steel.
3. Tie Bars and Brackets: Galvanized steel.
4. 1-1/2-inch insulation buildout with locking quadrant.

C. Low-Leakage Volume Dampers: Multiple- or single-blade, opposed-blade design, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
   1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch 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. Roll-Formed Steel Blades: 0.064-inch thick, galvanized, sheet steel.
   3. Blade Seals: Felt.
   4. Blade Axles: Galvanized steel.
   5. Tie Bars and Brackets: Galvanized steel.
   6. 1-1/2-inch insulation buildout with locking quadrant.

D. Jackshaft: 1-inch diameter, galvanized steel pipe rotating within a 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 of a multiple-damper assembly.

E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

A. General: Labeled to UL 555 (sixth edition). Ruskin Model D1BD2-B (or design engineer approved equivalent). Dampers shall be marked with a UL-Classified fire protection rating and marked “For Use in Dynamic Systems”.

B. Fire Rating: One and one-half and/or three hours as indicated.

C. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

D. Mounting Sleeve: Provide factory-mounted sleeve and retaining angles.
   1. Minimum Thickness (Sleeve shall not extend more than 6" past wall or floor without factory installed access door): 16 gauge and length to suit application.

E. Mounting Orientation: Vertical or horizontal as indicated.

F. Blades: Roll-formed, interlocking, 0.034-inch thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch thick, galvanized steel blade connectors.

G. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

H. Fusible Link: Replaceable, 165 deg F rated as indicated.

2.5 COMBINATION FIRE / SMOKE DAMPERS (SFD)

A. General: Labeled to UL 555/UL 555S (sixth and fourth edition respectively) Combination fire and smoke dampers shall be labeled for one-and-one-half-hour rating to UL 555S. Provide Class II leakage rating. Dampers shall be marked with a UL-classified fire rating. Ruskin FSD-60 or approved equivalent. The SFD shall be listed to operate from the fire alarm control panel (FACP). Each SFD shall have an associated smoke detector that shall be addressable from the FACP. The smoke detector shall be provided by the Fire Alarm Contractor and installed by the Electrical Contractor. Coordinate damper installation with these trades.

B. Electric Fusible Link (EFL): 165 or 212 deg F rated as applicable.

C. Frame and Blades: 16 gauge, galvanized, sheet steel. Damper blades shall be airfoil-shaped, single-piece construction, with blade seals mechanically locked into blade edge (adhesive clip-on seals are not acceptable). Ruskin FSD-60 or equivalent. Damper blades shall be minimum 14 gauge. SFD's installed off vertical chases shall have vertical airfoil blades (Ruskin FSD 60-V or equivalent).

D. Mounting Sleeve: Factory-installed, 16 gauge, galvanized, sheet steel; length to suit wall or floor application. Sleeve shall not extend more than 6" past wall or floor without factory installed access door. SFD shall be capable of mounting on either side of wall and working with airflow in either direction. Provide manufacturer-recommended duct-to-sleeve joints.

E. Electric controlled closure is not less than 7 seconds or more than 10 seconds to prevent HVAC and duct damage. Damper shall have local reset button and shall have automatic reset after test, smoke detection or power failure conditions. Damper shall close upon loss of power or AHU shut down. Actuator shall be 120V.

F. Provide with stainless steel jam seals and bearings. (Bronze bearings are not acceptable)

G. Furnish and install dampers according to manufacturer's instructions and in compliance with the latest edition of the SMACNA Duct Manual and NFPA Standards (90, 92A, and 92B).

2.6 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into side strips suitable for mounting in ducts.

2.7 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. Provide where indicated on drawings low leakage spin-in access doors for sheet metal applications. Flexmaster Inspector series.

B. The outer frame shall be constructed of a single piece of 24-gauge G90 galvanized steel roll formed and notched for spin-in applications. The entry side shall be roll formed and double hemmed for safe entry and exit.

C. The inner door shall be constructed of a 24-gauge draw quality steel, filled with a 1-inch thick polystyrene insulation and held in place by a galvanized steel backplate (stainless steel backplate may be substituted as required).

D. A continuous .375-inch wide by .1875-inch thick open cell adhesive neoprene gasket shall be installed in the door frame to provide a positive seal upon insertion and locking of the door.

E. The door shall be held secure with evenly spaced cast aluminum cam latches for even pressure against the gasket.

2.8 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.

C. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.
1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp, and 360 lbf/inch in the filling.

D. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.
1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp, and 440 lbf/inch in the filling.

2.9 INSULATED FLEXIBLE DUCT, LOW PRESSURE

A. Flexmaster type 1M UL181 Class I Air Duct. (No exceptions)

B. The duct shall be constructed of a PE 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 2-1/2 times the working pressure.

D. The duct shall be rated for a velocity of at least 4000 feet per minute.

E. The duct must be suitable for continuous operation at a temperature range of -20 deg F to +250 deg 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 6-foot length of straight duct when tested in accordance with ASTM E 477, at a velocity of 500 feet per minute, shall be at least:

Octave Band	**2**	**3**	**4**	**5**	**6**	**7**
Hz.	125	250	500	1000	2000	4000
8" diameter	5.6	10.6	23.9	34.0	22.5	17.0
10" diameter	4.4	27.7	25.7	32.0	21.3	12.4
12" diameter	6.6	27.8	22.8	29.0	18.7	10.9

G. Factory insulate the flexible duct with fiberglass insulation. The R-value shall be at least 6 at a mean temperature of 75 deg F.

H. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim (FSK) having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E 96, Procedure A.

2.10 SIDE TAKEOFF FITTINGS

A. Provide Flexmaster Model STOD or SBMD takeoff for sheet metal for all taps connecting to flex duct, except for air devices with OBD's and flow bar. For devices with OBD, use Flexmaster Model STO- or SBM no exceptions.

B. The side takeoff fittings shall maintain a ratio of 1:1 of inlet to outlet on all units over 7-inch diameter to allow proper sizing of the duct system.

C. Model STOD side takeoff shall have a 1-inch offset rear edge for enhanced pressure drop characteristics and 1-1/2-inch insulation buildout with locking hand quadrant.

D. Fittings shall have a 1-inch-wide prepunched mounting flange with corner clips and adhesive gasket for minimal leakage and ease of installation.

E. The fittings shall be constructed of a two-piece 26-gauge G-90 galvanized steel body and collar.

F. The overall length of the fitting shall be 13 inches with or without damper to reduce turbulence in the airstream.

G. The round outlet shall be provided with a rolled stiffener bead for strength and ease of installation and sealing of spiral and flexible ductwork joints.

2.11 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 length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch, zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.12 MOTORIZED CONTROL DAMPERS

A. Manufacturers:
1. Greenheck.
2. Nailor Industries Inc.
3. Ruskin Company.
4. Pottorff.

B. General Description: AMCA-rated, opposed-blade design; minimum of 0.1084-inch thick, galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch thick, galvanized-steel damper blades with maximum blade width of 8 inches.
1. Secure blades to ½-inch 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.
3. Provide parallel- or opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper

area, at differential pressure of 4-inch wg when damper is being held by torque of 50 in.×lbf (5.6 N×m); when tested according to AMCA 500D.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. When installing volume dampers in lined duct, avoid damage to and erosion of duct liner.

C. Install manual volume dampers at all main branch lines for ease of balancing.

D. Provide test holes at fan inlet and outlet and elsewhere as indicated.

E. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
   1. Install fusible links in fire dampers.

F. Install mounting angles, minimum of 1 ½ "x 1 ½ "x 20 gauge steel on both sides of SFD or FD.

G. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, smoke-fire dampers, turning vanes, and equipment.

H. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting and maintaining accessories and terminal units.
   1. Install access panels on side of duct where adequate clearance is available.
   2. Label access doors according to Specification Section “Mechanical Identification.”

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 Specification Section "Testing, Adjusting, and Balancing."

END OF SECTION

SECTION 23 3423

HVAC POWER VENTILATORS

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. Ceiling-mounting ventilators.
   2. Centrifugal roof ventilators
   3. Destratification fans
   4. In-line centrifugal fans.
   5. Propeller fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

C. Fan Unit Schedule: The following information is described in an equipment schedule on the Drawings.
   1. Fan performance data including capacities, static pressure, sound power characteristics, motor requirements and electrical characteristics.
   2. Fan arrangement, including wheel configuration inlet and discharge configurations and required accessories.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties and accessories for each type of product indicated and include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages and operators.
   6. Roof curbs.
   7. Fan speed controllers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components and location and size of each field connection.
   1. Wiring Diagrams: Power, signal and control wiring.
   2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails and base weights.

C. Coordination Drawings: Show roof penetration requirements and reflected ceiling plans drawn to scale and coordinating roof penetrations and units mounted above ceiling. Show the following:
1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Maintenance Data: For power ventilators to include in maintenance manuals specified in Division 1.

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. AMAC Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

E. Listing and labeling: Provide electrically operated fixtures specified in this section that are listed and labels.
1. The terms “Listed” and “Labeled”. As defined in the Nations Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing laboratory” (NTRL) as defined in OSHA Regulation 1910.7.

F. UL Standard: Provide Power Ventilators that comply with UL 762, grease laden air at 300 deg. F where applicable (kitchen exhaust).

G. Warranty: The manufacturer’s standard warranty shall be for a period of 12 months from the date of Substantial Completion. Warranty is limited to manufacturer defects only. The warranty shall include parts and labor during this period.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, are required for moving to final location, according to manufacturer’s written instructions.

C. Lift and support units with manufacturer’s designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Specification Section “Cast-In-Place Concrete”.

C. Coordinate installation of roof curbs, equipment supports and roof penetrations. These items are specified in Specification Section “Roof Accessories”.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Belts: One set for each belt-driven unit.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field Measurements. Verify clearances.

B. Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated and fans have been commissioned.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Centrifugal Roof Ventilators:
      a. Cook, Loren Company
      b. Envirofan
      c. Greenheck Fan Corp.
      d. Leading Edge

2.2 CEILING-MOUNTING VENTILATORS

A. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

B. Housing: Steel, lined with acoustical insulation

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor and fan wheel shall be removable for service.

D. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Filter: Washable aluminum to fit between fan and grille.

3. Isolation: Rubber-in-shear vibration isolators.
4. Manufacturer's standard roof jack or wall cap and transition fittings.

G. Capacities and Characteristics: Refer to drawing schedules.

2.3 IN-LINE CENTRIFUGAL FANS

A. Description: In-line, direct or belt-driven (as scheduled on the drawings) centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets and accessories.

B. Housing: Spilt, spun aluminum with aluminum straightening vanes, inlet and outlet flanges and support bracket adaptable to floor, side wall or ceiling mounting.

C. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, air foil blades welded to aluminum hub.

F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Companion Flanges: For inlet and outlet duct connections.
3. Fan Guards: 1/2 by 1 inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

G. Capacities and Characteristics: Refer to drawing schedules.

2.4 MOTORS

A. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.

B. Enclosure Type: The following features are required as indicted.
1. Open drip proof motors where satisfactorily housed or remotely located during operation.
2. Guarded drip proof where exposed to contact by employees or building occupants.

C. All motors shall be pre-wired to the disconnect at the factory.

2.5 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support inline fans with galvanized all thread and spring isolators with a static deflection of 1 inch.

C. Support suspended units from structure using galvanized threaded steel rods and spring hangers. Vibration –control devices are specified in Specification Section “Mechanical Vibration controls and Seismic Restraints.”

D. Secure roof-mounting fans to roof curbs with stainless steel hardware. Anchor fan to curb with a minimum of two (2) fasteners per side. Refer to Specification Section “Roof Accessories” for installation of roof curbs.

E. Ceiling Units: Suspect units from structure; use steel wire or metal straps.

F. Install units with clearances for service and maintenance.

G. Label units according to requirements specified in Specification Section “Mechanical Identification.”

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Mechanical Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors for all fans; no exceptions. Flexible connectors are specified in Specification Section “Duct Accessories.”

B. Install duct adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Specification Section “Grounding and Bonding.”

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
1. Verify that shipping, blocking and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction and verity fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verity lubrication for bearings and other moving parts.
8. Verity that manual and automatic volume control and fire and smoke dampers in connected ductwork system are in fully open positions.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Starting Procedures:
   1. Energize motor and adjust fan to indicated rpm.
   2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Specification Section “Testing, Adjusting and Balancing” for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Specification Section “Testing, Adjusting and Balancing for HVAC” for testing, adjusting and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

3.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer’s written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burns, dirt and construction debris and repair damaged finished.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain power ventilators.
   1. Train owner’s maintenance personnel on procedures and schedules for starting and stopping, troubleshooting servicing, and maintaining equipment and schedules.
   2. Review data in maintenance manuals. Refer to Specification Section “Closeout Procedures.”
   3. Review data in maintenance manuals. Refer to Specification Section “Operation and Maintenance Data.”
   4. Schedule training with Owner, through Architect, with at least seven days’ advance notice.

3.7 COMMISSIONING

A. Final Checks before Startup: Perform the following operations and checks before startup:
   1. Verify that shipping, blocking and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections for piping, ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters and disconnects.
   3. Perform cleaning and adjusting specified in this Section.
   4. Disconnect fan drive from motor, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts and install belt guards.
   5. Lubricate bearings, pulleys, belts and other moving parts with factory-recommended lubricants.
   6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in the fully open position.
   7. Disable automatic temperature-control operators.

B. Starting Procedures for fans are as follows:
   1. Energize motor; verify proper operation of motor, drive system and fan wheel. Adjust fan to be indicated RPM.
   2. Measure and record motor voltage and amperage.

C. Shut unit down and reconnect automatic temperature-control operators.

D. Refer to Specification Section “Testing, Adjusting and Balancing,” for procedures for air-handling-system testing, adjusting and balancing.

E. Replace fan and motor pulleys as required to achieve design conditions.

END OF SECTION

SECTION 23 3713

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. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:
   1. Specification Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
   2. Specification Section "Testing, Adjusting, and Balancing" for balancing diffusers, registers and grilles.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:
   1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
   2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
   3. Schedule of diffusers, registers, and grilles indicating drawing designation, model number, size, and accessories furnished.
   4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

1.5 QUALITY ASSURANCE

A. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Krueger
   2. Metalaire
   3. Price
   4. Titus

B. Performance characteristics, specific models, material, features, dimensions and finishes of diffusers, registers, and grilles are scheduled on Drawings.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

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. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

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. Coordinate with architectural Reflected Ceiling Plans. Locate devices where indicated, as much as practical. 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 connection 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.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 23 8126

SPLIT-SYSTEM AIR-CONDITIONING UNITS

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 split system air conditioning and heat pump units consisting of separate evaporator fan and compressor condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Specification Compliance Review:
   1. Manufacturers and bidders must provide the consulting engineer with a Compliance Review of the Specifications and Addenda's. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications and schedule with the following information; "C", "D", or "E" marked in the margin of the original Specifications and any subsequent Addenda's. If the manufacturer or bidder does not provide the Compliance Review to the engineer for review, with the submittal, the submittal will be subject to rejection as non-compliant.
      a. "C" Comply with no exceptions.
      b. "D" Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
      c. "E" Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives. Non-compliance with the specifications is grounds for rejection as unacceptable. A bid from any alternative or listed equipment manufacturer with any number of exceptions will be reason for rejection for non-compliance without further review.
      d. Unless a deviation or exception is specifically noted in the Compliance Review, the manufacturer shall provide full compliance with entire specification. Deviations or exceptions taken in letters or cover letters in a bid document, subsidiary documents, by omission or by contradiction do not release the manufacturer or bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review and approved by the consulting engineer.
      e. Equipment manufacturers or bidders that do not meet the specifications thru the above process will be subject to rejection without further review.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Field quality-control test reports.

F. Operational and Maintenance Data: For split-system air-conditioning units to include in emergency operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Specification Section “Product Requirements.”

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Energy-Efficiency Ratio (EER): Equal to or greater than prescribed by ASHRAE 90.1,”Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.”

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, “Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.”

E. Units shall be designed to operate with HCFC-free refrigerants.

1.5 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Specification Section “Special Conditions for All Mechanical Work.”

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Specification Section “Special Conditions for All Mechanical Work.”

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carrier Air Conditioning; Div. of Carrier Corporation
2. Misubishi
3. Trane Company (The); Unitary Products Group.
4. York International Corp.

2.2 CONCEALED EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
1. Insulation: Faced, glass-fiber duct liner.
2. Drain Pans: Galvanized steel, with connection for drain; insulated.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contractors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

D. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

E. Fan Motors:
1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

F. Disposable Filters: 1 inch (25 mm) thick, in fiberboard frames.

G. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current sensitive overload devices, start capacitor, relay, and contactor.
1. Compressor Type: Scroll
2. Manual reset high pressure switch and automatic reset low pressure switch.
3. Refrigerant Charge: R-410.
4. 1 Compressor per unit

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid sub-cooler.

D. Heat Pump Components: Reversing valve and low temperature air cut-off thermostat.

E. Fan: Aluminum propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal overload protection.

G. Coordinate with drawing schedule for additional requirements.

2.4 ACCESSORIES

A. Unit shall have local control unless specified to be part of central control system.

B. Low-Voltage Control Wiring: Provide plenum-rated cabling (six-conductor) per manufacturer.

C. Thermostat: Low-voltage, programmable, with the following functions and features:
1. Auto changeover (heat/cool).
2. Seven-day programmable with three (3) different occupied settings per day.
3. Large backlit liquid crystal display indicating temperature, setpoint temperature, time setting, operating mode, and cool/heat mode.

4. Three (3) security levels with keypad lockout.
5. Non-volatile memory.
6. Four-hour override/setback.
7. Seven-day holiday setback.

D. Automatic reset timer to prevent rapid cycling of compressor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground mounting, compressor condenser components on 4-inch- (100-mm-) thick, reinforced concrete base; 4 inches (100 mm) larger on each side than unit. Concrete, reinforcement, and formwork are specified in Specification Section "Special Conditions for All Mechanical Work." Coordinate anchor installation with concrete base.

D. Install compressor condenser components on equipment supports specified in Specification Section "Special Conditions for All Mechanical Work." Anchor units to supports with removable, cadmium plated fasteners.

E. Install condensing unit on Korfund or equal pads and secure to housekeeping pad.

F. Charge unit with manufacturer required refrigerant and amount.

G. Support refrigerant piping from structure with hangers and saddles.

H. Insulate refrigerant lines with Armaflex. Provide aluminized jacket for exterior insulation.

I. Install t-stat in room on wall not in airflow stream. Connect t-stat to compressor/evaporator.

J. Provide condensate overflow switch to de-energize unit.

K. Provide and install plenum rated control cabling between condensing unit and evaporator.

3.2 CONNECTIONS

A. Connect condensate line to unit. Route condensate to floor drain. Support piping from structure with pipe hangers. Insulate condensate line with Armaflex.

B. Connect unit to controls system. Controls shall alarm with unit failure.

C. Piping installation requirements are specified in other **Mechanical and Plumbing** Sections.

D. Install piping adjacent to unit to allow service and maintenance.

E. Duct Connections: Duct installation requirements are specified in Specification Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to

split system air conditioning units with flexible duct connectors. Flexible duct connectors are specified in Specification Section "Duct Accessories."

F. Ground equipment according to Specification Section "Grounding and Bonding."

G. Electrical Connections: Comply with requirements in electrical specification sections for power wiring, switches, and motor controls. Install control wiring in conduit per electrical specification sections. All cabling shall be plenum rated. Disconnects shall be provided for the evaporator and condensing unit. Provide conduit and conductors from condensing unit to evaporator in conduit. Minimum #10 wire.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 23 8560

INTAKE AND RELIEF VENTILATORS

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 types of roof-mounting intake and relief ventilators:
   1. Roof hoods.
   2. Goosenecks

B. Related Sections include the following:
   1. Specification Section “Louvers and Vents” for ventilator assemblies provided as part of the general construction.
   2. Specification Section “Power Ventilators” for roof-mounting exhaust fans.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Intake and relief ventilators shall be capable of withstanding the effects of gravity loads, wind loads, and thermal movements without permanent deformation of components, noise or metal fatigue, or permanent damage to fasteners and anchors.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For intake and relief ventilators. Include plans, elevations, sections, details, and ventilator attachments to curbs and curb attachments to roof structure.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain ventilators through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

C. Product Options: Drawings indicate size, profiles and dimensional requirements of intake and relief ventilators and are based on the specific equipment indicated. Refer to Section “Product Requirements.”

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.2, "Structural Welding Code-Aluminum."
2. AWS D1.3, "Structural Welding Code-Sheet Steel."

1.6 COORDINATION

A. Coordinate installation of roof curbs and roof penetrations. These items are specified in Section "Roof Accessories."

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 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer for required finish.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) zinc coating, mill phosphatized.

D. Stainless-Steel Sheet: ASTM A 666, Type 304, with No. 4 finish.

E. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
1. Use types and sizes to suit unit installation conditions.

F. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Factory or shop fabricate intake and relief ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.4 ROOF HOODS

A. Manufacturers:
1. Greenheck.
2. Loren Cook Company.

B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 5-6 and 5-7.

C. Materials: Aluminum sheet, minimum 0.063-inch- (1.6-mm-) thick base and 0.050-inch- (1.27-mm-) thick hood; suitably reinforced.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded comers: 1-1/2-inch- (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.
1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 12 inches (300 mm).

E. Bird Screening: Aluminum, 1/2-inch- (12.7-mm-) square mesh, 0.063-inch (1.6-mm) wire.

F. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

2.5 GOOSENECKS

A. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 5-5; with a minimum of 0.052-inch- (1.3-mm-) thick, galvanized-steel sheet.

B. Roof Curbs: Galvanized-steel sheet; with mitered and welded comers: 1-1/2-inch (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.
1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 12 inches (300 mm)

C. Bird Screening: Galvanized steel, 1/2-inch- (12.7-mm-) square mesh, 0.041-inch (1.04-mm) wire.

D. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install intake and relief ventilators level, plumb, and at indicated alignment with adjacent work.

B. Secure intake and relief ventilation to roof curbs with cadmium-plated hardware. Use concealed anchorages where possible.

C. Install goosenecks on curb base where throat size exceeds 9 by 9 inches (230 by 230 mm).

D. Install intake and relief ventilators with clearances for service and maintenance.

E. Install perimeter reveals and openings of uniform width for sealants and joint fillers as indicated.

F. Install concealed gaskets, flashings, joint fillers and insulation as installation progresses. Comply with Section “Joint Sealants” for sealants applied during installation.

G. Label intake and relief ventilators according to requirements specified in Specification Section “Mechanical Identification.”

H. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

I. Repair finishes damaged by cutting, welding, soldering and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations and refinish entire unit or provide new units.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Mechanical Sections. Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

END OF SECTION

SECTION 26 0005

ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. 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 Sections include the following:
   1. Division 1 Section “Summary” for use of premises, phasing, and Owner-occupancy requirements.
   2. Division 1 Section “Photographic Documentation” for preconstruction photographs taken before selective demolition operations.
   3. Division 1 Section “Temporary Facilities and Controls” for temporary construction and environmental-protection measures for selective demolition operations.
   4. Division 1 Section “Construction Waste Management” for disposal of demolished materials.
   5. Division 1 Section “Cutting and Patching” for cutting and patching procedures.
   6. Division 2 Section “Building Demolition” for demolition of entire buildings, structures, and site improvements.
   7. Division 2 Section “Site Clearing” for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner cleaned, packaged, and ready for reuse.

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

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

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value

to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1. Coordinate with Owner's representative, who will establish special procedures for removal and salvage.

1.5 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shut-off, capping, and continuation of utility services.
   4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
   5. Means of protection for items to remain and items in path of waste removal from building.

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

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
   1. Comply with submittal requirements in Division 1 Section "Construction Waste Management."
   2. Dispose of ballasts and lamps in accordance with current EPA Standards.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
   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.

1.7 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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

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

D. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

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

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

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

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

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

E. Trace circuits feeding existing to-remain portions of the building. Do not demolish circuits in these areas. If circuits are in both “to remain” and “to be removed” areas, demolish back to nearest to-remain J-Box.

F. Provide to the Engineer a diagram and index of circuits traced in the “to remain” areas.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
   1. Comply with requirements for existing services/systems interruptions specified in Division 1 Section “Summary.”

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
      a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Division 1 Section “Temporary Facilities and Controls.”

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. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
   3. Maintain adequate ventilation when using cutting torches.
   4. Dispose of demolished items and materials promptly.

B. Removed and Salvaged items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner’s storage area designated by Owner.
   5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.

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

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

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them 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.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 26 0015

GENERAL CONDITIONS FOR ALL ELECTRICAL WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Conditions of the Contract (General and Supplementary Conditions) and Division 1 specification sections, apply to work of this section.

B. The requirements of this section apply to all sections of electrical, signal, and life safety, and all sections that are installed by the electrical contractor to include electrical work done under the mechanical contractor.

1.2 DESCRIPTION OF WORK

A. This section covers the general provisions of the electrical specifications applicable to the following systems:
   1. Electrical power and lighting to include generators, UPS Systems, and passive electrical generating equipment (solar).
   2. All Special Systems (fire alarm, security, telephone, data, television, and annunciators associated with power).
   3. Control wiring associated with electrical or mechanical equipment.

B. The use of the word “electrical” in any specification contained within the electrical, signal, or life safety division sections shall include all aspects of each systems complete install. This shall be extended to mechanical or plumbing signal systems.

C. The use of the work “life safety” shall refer to all fire alarm, fire protection, and mass notification systems installed by the electrical contractor.

D. The use of the word “mechanical” shall refer to both mechanical and plumbing.

E. The use of the word “pipe” shall refer to all electrical raceway.

1.3 DRAWINGS

A. These specifications are accompanied by drawings of the building and details of the installations showing the locations of equipment, lighting, panels, etc. The drawings and these specifications are complementary to each other, and what is called for by one shall be as binding as if called for by both.

B. Drawings and specification conflicts shall be identified as early as possible to ensure conflict resolution prior to installation. The contractor shall not install any equipment with known conflicts or pending information requests. The contractor shall contact the Engineer of Record or their representative for information clarification prior to installing any item that is in question. The contractor shall not install any equipment that is not consistent with the manufacturers approved installation instructions unless directed by the engineer.

C. In all cases all installations shall be at least in accordance with all the approved codes and their local amendments. The drawings and specifications may exceed local code allowances and the most stringent applies. The existence or allowance of a practice or product by code does not supersede requirements of the drawings and specifications. In other words, just because it is allowed by code does not mean that it is allowed on this project.

D. If any departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Owner's Representative for approval. No departures shall be made without prior written approval by the Owner's Representative.

E. There are intricacies of construction which are impractical to specify or indicate in detail; however, in such cases, the current rules of good practice and applicable specifications shall govern. In all cases the requirements specified in the NEC and local jurisdiction shall be followed.

F. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical, and Electrical drawings and applicable shop drawings where such information affects his work. The contractor shall review the entire construction document set both prior to bid and construction.

G. All dimensional information related to new structures shall be taken from the appropriate drawings. All dimensional information relative to existing facilities shall be taken from actual measurements made by the Contractor on the site.

H. Any duplicate circuiting listed on the drawings shall be bid as multiple circuits with the intention of the next available circuit and breaker to be used. The contractor shall bring this to the attention of the engineer for clarification and updating the drawings. The new circuit numbers shall be annotated on both the panel schedules and the record drawings. The contractor is not required to follow the exact circuit numbers on the panel schedules (balancing phases, wiring convenience, or conduit routing installation), however, the contractor is responsible for keeping the panel schedules accurate and up to date in addition to ensuring the circuit numbers are identified correctly.

I. Any installation that is not in compliance with these requirements shall be corrected at the contractors cost and responsibility.

1.4 BIDDING

A. The contractor is responsible for bidding complete and working systems. In the event that some part of the system is not included in the construction document or the specifications and it is a necessary part of the system to work properly, the contractor shall include that work as part of the bid amount. This includes, but not limited to:
   1. Power for equipment shown on the drawings. Examples include, but are not limited to:
      a. Equipment Panels
      b. Controllers
      c. Electronic Devices
      d. Mechanical Equipment
      e. Plumbing Equipment
   2. Cabling to communicate with the head end equipment. Examples include, but are not limited to:
      a. Generator to Annunciator
      b. Generator and ATS
      c. Security

d. Access Control
e. Switching
f. Equipment starters and the switching locations
g. Monitoring equipment

B. The contractor is not responsible for interpreting additional accessory options that are not included in the drawings or specifications or equipment that is not shown or indicated as part of the entire contract documents or specifications.

C. The contractor shall review the entire set of specifications and contract documents for all equipment and connections requiring electrical work.

D. Equipment Substitutions or Proposed Equivalents:
1. Contractor shall submit proposed substitutions or equivalents to the Architect or engineer during the bidding process prior to any final dates for questions as indicated on the bid forms or RFP's and provide a reasonable time to complete to comparison. All changes to the documents indicated a deviation from the specifications or drawings shall be part of the addenda process or written notification from the engineer of record, architect, owner, or a designated representative. Reasonable time for review is minimum one working week. The contractor shall retain the written notification of approval (if not published in an addenda) for purposes of future verification.
2. The contractor is responsible for providing full comparison information for the products to be substituted. Incomplete information is subject to immediate rejection.
3. Bids taken for equipment that is not approved is under the contractors own risk. Should the equipment be rejected under the post bid submittal process, the contractor is responsible for providing the specified equipment at no cost to the owner.
4. Under no circumstances should the contractor accept bids for non-specified equipment from vendors who do not have prior approval or "speculate" that it will be approved. This is subject to immediate rejection and the specified equipment shall be required to be installed.
5. No response from the architect, owner, or engineer shall not be considered an approval.

1.5 CONSTRUCTION REQUIREMENTS

A. The architectural, structural, and electrical plans and specifications and other pertinent documents issued by the Architect are a part of these specifications and the accompanying electrical drawings, and shall be complied with in every respect. All the above is included in the Contract Documents, and shall be examined by all bidders. Failure to comply shall not relieve the Contractor of responsibility or be used as a basis for additional compensation because architectural, structural, or mechanical details were not included in the electrical drawings.

B. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.

C. The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to comply with Codes, to facilitate the work of other trades, to conform to the

details of the installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated satisfactory operating installation.

D. The mechanical, electrical, and associated drawings are necessarily diagrammatic in character and do not show every connection in detail or every pipe or conduit in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. It shall be the contractor's responsibility to coordinate with other disciplines to facilitate their equipment installation.

E. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and above suspended ceilings, etc. in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc. shall be provided as hereinafter specified or as otherwise indicated or required. All work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.

F. Conduit and equipment are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The plans do not show all required offsets, elbows, and other location details. Work shall be concealed in all finished areas. Conduit is intended to be installed with factory fittings or bent in a professional, workmanlike manner.

G. All parts of equipment requiring adjustment shall be easily accessible. Equipment shall be so located and installed as to permit convenient and safe maintenance and future replacement. The trade furnishing the equipment shall be responsible for notifying the Contractor, who shall notify the Owner's Representative prior to ordering same in the event that equipment specified and/or proposed is incompatible with this requirement.

H. Location of Lighting and Outlets in Rooms:
   1. All lighting, plumbing, acoustical tile, modular lighting outlets, diffusers, sprinkler heads, grilles, registers, and other devices shall be referenced to coordinated, established data points and shall be located to present symmetrical arrangements with these points and to facilitate the proper arrangements of acoustical tile panels and other similar panels with respect to the mechanical outlets and electrical lighting and devices. Those mechanical and electrical outlets shall be referenced to such features as wall and ceiling furring's, balanced border widths, masonry joints, etc. Outlets in acoustical tile shall occur symmetrically in tile joints or in the centers of whole tiles. The final determination of the exact location of each outlet and the arrangements to be followed shall be acceptable to the Owner's Representative.
   2. The drawings show diagrammatically the locations of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc. by measurements at the building, and in cooperation with the other trades. The Owner reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner or the Architect. Contractor shall coordinate work with architectural reflective ceiling plan.

I. The Contractor, by submitting a bid on this work, sets forth that he has the necessary technical training and ability, and that he will install his work in a satisfactory and workmanlike manner which is up to the best standards of the trade, complete and in good working order. If any of the requirements of the plans and specifications are impossible of performance, or if

the installation when made in accordance with such requirements will not perform satisfactorily, he shall report same to the Owner's Representative for correction promptly after discovery of the discrepancy.

J. No extra compensation will be allowed for extra work or change caused by failure to comply with the above requirements.

1.6 JOB CONDITIONS

A. Submittal of bid implies bidder has read paragraphs of the specifications and will be bound by their conditions.

B. Contractor Qualifications: A minimum of five years' experience installing commercial electrical power lighting and special systems, similar to those described in these specifications, and make available at the owner or engineer's request a list of five previous projects including name of project and contact person names and phone numbers as a separate document in addition to the bid or proposal submitted.

C. Contractor must be licensed and hold a current contracting license that has been valid for a minimum of five years in the local State.

D. Contractor must be able to bond work for performance of work being bid and provide a written statement from the bonding agency proposed to be used for this project as a separate document in addition to the bid or proposal submitted. The bonding agency proposed to be used shall have a Best's insurance rating of A or A+.

1.7 INSPECTION OF THE SITE

A. The Contractor shall visit the site, verifying all existing items indicated on drawings and/or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil conditions, structures, utilities, equipment, systems, facilities, and local requirements. The submission of bids shall be deemed evidence of such visits. All proposals shall take these existing conditions into consideration, and the lack of specific information shall not relieve the Contractor of any responsibility.

1.8 PERMITS, UTILITY CONNECTIONS, AND INSPECTIONS

A. Fees and Costs: The contractor shall obtain and pay for all permits, utility connections, utility extensions, and/or relocations and pay all costs required by the utility, including inspection fees, for all work included therein.

B. Compliance: The Contractor shall comply in every respect with all requirements of local inspection departments, Board of Fire Underwriters, local ordinances and codes, and utility company requirements. In no case does this relieve the Contractor of the responsibility of complying with these specifications and drawings where specified conditions are of a higher quality than the requirements of the above-specified offices. Where requirements of the specifications and drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above offices.

C. Utilities: The Contractor shall check with the various utility companies involved in this project and shall provide complete in all respects the required utility relocations, extensions, modifications, and/or changes. Contractor shall verify the location of all existing utilities with

the applicable Utility Company. The Contractor shall be responsible for all damages to existing utilities caused by his construction work, whether indicated on drawings or not, and repair all damage to existing utilities as acceptable to the Utility Company concerned.

D. Utility Services:
1. Power for the building service shall be obtained from local utility service. Contractor shall coordinate with the local utility for shutdowns and transformer installations. Contractor shall coordinate underground feeders with other underground piping and mark his conduit clearly. Contractor shall install feeders to the building transformer in accordance with
2. Contractor shall coordinate meter location and provide access in accordance with local utility requirements.
3. Transformer and ductbank rough-ins shall be in accordance with Utility provider requirements.

E. Contractor Temporary Power: The contractor shall obtain temporary power in their name, from the local utility for the construction trailer and any equipment needed to perform his work. The contractor shall be responsible for the installation and removal of the temporary service at the conclusion of the project.

F. Certification: Prior to final acceptance, the Contractor shall furnish a certificate of acceptance from the inspection departments having jurisdiction over the work for any and all work installed under this Contract. Any additional labor costs incurred as a result of a substitution shall be the Contractor's responsibility.

1.9 EXISTING FACILITIES

A. The Contractor shall be responsible for loss or damage to the existing facilities caused by him and his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices, make necessary arrangements, and perform other services required for the care, protection, and in-service maintenance of all electrical and special systems for the new and existing facilities. The Contractor shall erect temporary barricades, with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work. Barricades shall clearly indicate with signage that which they are protecting. Contractor shall observe all OSHA rules.

B. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.

C. Where existing construction is removed to provide working and extension access to existing utilities, Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, and equipment, etc. to provide this access and shall reinstall same upon completion of work in the areas affected.

D. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed, all Contractors shall remove and reinstall in locations approved by the Architect/Engineer all devices required for the operation of the various systems installed in the existing construction. This is to include but is not limited to temperature controls system devices, electrical switches, relays, fixtures, piping, conduit, etc.

E. Outages of services as required by the new installation will be permitted but only at a time approved by the Owner. The Contractor shall allow the Owner two weeks in order to

schedule required outages. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount. Unless otherwise scheduled by the Owner, planned shutdowns of the existing facilities shall occur between 6 p.m. Friday through 5 am Monday. The existing building shall be ready for morning start-up by 5 am Monday.

1.10 DEMOLITION AND RELOCATION

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination or otherwise disposed of as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon the approval of the Owner, substitute new materials and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor's responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at no additional cost to the Owner.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

1.11 SUBMITTAL DATA

A. General: As soon as practical and within 30 days after the date of award of contract and before purchasing or starting installation of any materials or equipment, the Contractor prepare or cause to be prepared shop drawings, product data, materials and equipment lists, diagrams, data, samples, and other submittals as required by the contract documents, hereinafter referred to as "Submittal Data." The Contractor shall review and approve all submittal data for compliance with the contract documents, manufacturer's recommendations, adequacy, clearances, code compliance, safety, and coordination with associated work.

B. The Contractor shall submit approved submittal data to the Owner's Representative for review and comment as to general conformance with the design concept and general compliance with information given in the contract documents. Owner's Representative's

review shall not include review of quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with other trades or work, or construction safety and precautions, all of which are the sole responsibility of the Contractor. The reviewers shall make every effort to “catch” discrepancies and identify these to the contractor prior to ordering equipment. However, it shall remain the contractor’s responsibility to order and install the equipment as listed in the drawings and specifications. At the owner’s representative’s discretion a detailed submittal may be required.

C. Substitutions shall be clearly identified as such in the submittal by a cover sheet indicating that items are different from what is specified or scheduled. It shall be the contractor responsibility to provide complete substitution information so an accurate comparison can be made.

D. Detail Submittals: Materials and equipment requiring detailed submittal data shall be submitted with sufficient data to indicate that all requirements of the specifications have been met and samples shall be furnished when requested. All manufacturer’s data used as part of the submittal shall have all non-applicable features crossed out or deleted in a manner that will clearly indicate exactly what is to be furnished. The detailed submittals shall be accompanied by the same number of sets of pictorial and descriptive data derived from the manufacturer’s catalogs and sales literature, or incorporated in the shop drawings. The Contractor may provide a detailed submittal on any item even though not required by the Owner’s Representative.

E. The Engineer’s review of Shop Drawings and Brochures shall not relieve the Contractor of the responsibility for dimensions, errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the Engineer’s noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the submittal data review.

F. The Contractor shall clearly and specifically identify and call to the attention of the Owner’s Representative any deviation from the contract documents for which Owner acceptance is desired. The responsibility for such a deviation accepted by the Owner shall remain with the Contractor.

G. Timeliness: The burden of timeliness in the complete cycle of submittal data is on the Contractor. The Contractor shall allow a minimum of four (4) weeks’ time frame for the submittal cycle of each submission by the Owner’s Representative. The Contractor is responsible for allowing sufficient time in the construction schedule to cover the aforementioned cycles of data processing, including time for all re-submission cycles on non-conforming materials, equipment, etc. covered by the data submitted. Construction delays and/or lack of timeliness in the above regard are the responsibility of the Contractor and will not justify any request for scheduled construction time extensions or extra compensation.

H. Work performed in accordance with approved submittal data that is not in accordance with the Contract Documents and did not have the specific acceptance of the Owner’s Representative shall be replaced at Contractor’s cost.

I. Submittals shall be provided in the following format:
   1. The submittal brochures shall be in pdf format. The first page shall be titled “ELECTRICAL SUBMITTAL INFORMATION” and shall list the name and location of project, the Owner, the Engineer(s), the General Contractor, and the Subcontractors installing equipment represented in the brochure.

2. A table of contents will follow the first page and shall list all of the sections contained in the specifications manual. Each section will be tabbed and will include its' respective brochures. All brochures will be three-hole punched and folded (if required). Each submittal section will correspond to the appropriate specification section number.
3. Provide submittal data for all materials to be used on this project as indicated in each specifications manual section.
4. Brochures submitted shall contain only information which is relevant to the particular equipment or materials to be furnished. Do not submit catalogs that describe several different items other than those items to be used unless all irrelevant information is marked out or relevant information is clearly marked.
5. Brochures: Brochures submitted to the Engineer shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information to show that the equipment will fit into the allotted space.
6. Any submittal that is disapproved must be resubmitted within two (2) weeks following notification of such disapproval. If no satisfactory material is submitted within the two-week period, the Engineer reserves the right to require the Contractor to furnish items exactly as described in the Contract Documents.
7. Unless a greater number is indicated within Division 1 of these specifications, submit six (6) copies of all submittal materials for review.
8. No allowances will be made for submittals which are not made in a timely fashion or which are turned down because they do not meet the specifications. Should delivery problems arise due to the above, affecting the completion time of the project, the Contractor will furnish and install acceptable alternates until the proper materials arrive and then replace the alternate materials with the approved materials, all at no cost to the Owner, Architect, or Engineer. If the Contractor is not able to furnish an acceptable alternate until the proper materials arrive, he will assume all costs for furnishing and installing all alternates as directed by the Engineer.
9. Submittal shall have the certification information as listed hereafter.
10. Shop Drawings:
    a. All shop drawings shall have the certification as listed hereafter.
    b. Each Shop Drawing shall indicate in the lower right hand corner and each Brochure shall indicate on the front cover the following: Title of the Sheet or Brochure; name and location of the building; names of the Engineer, Contractor, Manufacturer, Supplier, Vendor, etc., the date of submittal; and the date of each correction and revision. So far as is practical, each Shop Drawing and/or Brochure shall bear a cross-reference note to the sheet number or numbers of the Contract Drawings and Specifications showing the same work. Shop Drawings shall be prepared as follows:
        1) Shop Drawings: Drawings shall be newly prepared and not reproduced from the Contract Documents, drawn to a scale that can be easily read and shall contain sufficient plans, elevations, sections, and isometrics to describe clearly the items in question. Drawings shall be prepared by a draftsman skilled in this type of work. All equipment layouts and similar Shop Drawings shall be drawn to at least ⅛-inch = 1'-0" scale.
        2) All Shop Drawings shall indicate the equipment actually purchased. The elevation, location, support points, load imposed on the structure at support and anchor points, shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All Design Drawing space allocations shall be maintained, such as ceiling height, chase walls, equipment room size, etc., unless proper written authorization is required from the Engineer to change them. All associated equipment shall be coordinated and clearly shown on the Shop Drawings.
11. Submittal data for each section must be complete. Partial submittals, or submittals not in the specified format, will be rejected and returned to the Contractor without further review.

J. All equipment installed on this project shall have **local (within 125 miles)** representation, local factory-authorized service, and a local stock of repair parts. This requirement is essential and will be strictly reviewed by the Owner's Representative prior to concurrence with the Contractor's approval for all submittals covered by electrical division sections.

K. Physical Size of Equipment: Space is critical; therefore, equipment of larger sizes than shown, even though of approved manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operation, and maintenance.

L. These paragraphs related to electrical divisions submittal data rescind, amend, and supersede any provisions to the contrary contained in the Project Manual.

1.12 CERTIFICATION OF SUBMITTAL DATA

A. The Contractor shall provide the following notarized certificate with all submittal data furnished to the Owner's Representative for review and comment.

Project Title:

Description of Submittal Data:

This is to certify that the above-described submittal data has been reviewed and is approved for compliance with the Contract Documents, manufacturer's recommendation, adequacy, clearances, code compliance, safety, and coordination with other trades and/or work except as follows: (list "none" or itemize and explain). In addition, the Contractor shall submit to the Owner's Representative a signed statement from each representative certifying as follows:

EXCEPTIONS:

"I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations and are asbestos free."

_____

Notary

1.13 ACCEPTANCE OF MATERIALS AND EQUIPMENT

A. Owner's Manual: After the submittals have been accepted the Contractor is requested to include a minimum of three (3) additional copies for insertion in the project's Owner's Manuals at the completion of the project.

B. **NOTICE: The Contractor is responsible for providing materials and equipment that conform to the requirements of the project manual in every respect unless a deviation has been "accepted" in writing. Removal of any nonconforming materials and equipment and the replacement with conforming materials and equipment shall be at**

the Contractor's sole expense, regardless of when nonconformance was discovered. If the owner or owners representative elects to keep the equipment it shall be contractors responsibility to provide any additional connections or services required to make the equipment function as specified or required by the manufacturer. The contractor shall coordinate with other subs for any different material requirements (wire size, breakers, cooling, mounting requirements, etc.).

C. Approval of materials and equipment shall be based on manufacturer's published data and shall be tentatively subject to the submission of complete shop drawings which comply with the contract documents. Approval is also dependent upon the existence of adequate and acceptable clearances for entry, servicing, and maintenance.

D. Approval of materials and equipment under this provision shall not be construed as authorizing any deviations from the specifications, unless the attention of the Owner's Representative has been directed in writing to the specific deviations. Data submitted shall not contain unrelated information unless all pertinent information is properly identified.

1.14 SHOP DRAWINGS

A. As soon as practicable after the award of contract and approval of materials and equipment, but prior to installation, complete and detailed shop drawings of the following shall be submitted for review and comment:
1. Equipment arrangements.
2. Fire alarm system.
3. Data drops.
4. Security system.
5. Equipment foundations.
6. Factory-fabricated equipment and materials.
7. Anchors.
8. Control.
9. Interlock.
10. Switch gear configuration.
11. Other details as directed by the Owner's Representative. Composite drawings of areas requiring coordination between trades shall be provided and expedited to eliminate conflicts and to ensure maximum cooperation and work progress.

B. Work performed without benefit of reviewed and approved shop drawings **will not be recommended for payment by the Engineer** until such time as the shop drawings are submitted, reviewed, and approved. Any work performed without the benefit of reviewed and approved shop drawings may require removal, relocation, and/or replacement at the Contractor's sole expense in order to resolve conflicts between the various systems and provide the performance specified.

C. All installation of equipment, fixtures, terminal devices, etc. shall be made in accordance with approved composite shop drawings. The Contractor shall modify installation and relocate installed work to provide code clearances, service access, and eliminate conflict with other systems.

D. Submit one copy of shop drawings with each submittal. The shop drawing shall be marked with the A/E comments and returned to the Contractor for printing and distribution. Distribution shall include the return of three (3) prints of the approved shop drawings, with the A/E's comments included, to the A/E for the A/E's and Owner's use.

1.15 SITE OBSERVATION

A. Site observation by the Architect, Engineer, and/or Owner's Representative is for the express purpose of verifying compliance by the Contractor with the contract documents, and shall not be construed as construction supervision nor indication of approval of the manner or location in which the work is being performed as being a safe practice or place.

1.16 SUPERVISION

A. In addition to the Superintendent required under the conditions of the contract, each subcontractor shall keep a competent superintendent or foreman on the job at all times.

B. It shall be the responsibility of each superintendent to study all plans and familiarize himself with the work to be done by other trades. He shall coordinate his work with other trades and, before material is fabricated or installed, make sure that his work will not cause an interference with another trade. Where interferences are encountered, they shall be resolved at the jobsite by the superintendents involved. Where interferences cannot be resolved without major changes to the plans, the matter shall be referred to the Owner's Representative for comments.

1.17 OPERATION PRIOR TO COMPLETION

A. When any piece of electrical equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so, providing that he properly supervises the operation and has the written permission of the Owner's Representative to do so. The contractor shall energize the power distribution in a timely manner to facilitate completion of other trades work. Electrical lighting shall be energized after ceiling has been completed. New permanent fixtures shall not be used as temporary under any circumstances. The warranty period shall not commence, however, until such time as the equipment is operated for the beneficial use of the Owner or date of substantial completion, whichever occurs first.

B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of acceptance and the start of the warranty may not be the same date.

1.18 MANUFACTURER'S RECOMMENDATIONS

A. The manufacturer's published directions shall be followed in the delivery, storage, protection, installation, piping, and wiring of all equipment and material. The Contractor shall promptly notify the Owner's Representative, in writing, of any conflict between the requirements of the contract documents and the manufacturer's directions, and shall obtain the Owner's Representative's comments before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or applicable comments from the Owner's Representative, he shall bear all costs arising in connection with the correction of such deficiencies.

1.19 CHECKING AND TESTING MATERIALS AND/OR EQUIPMENT

A. Before final acceptance of the work, an authorized representative of the manufacturer of the installed materials and/or equipment shall personally inspect the installation and operation of his materials and/or equipment to determine that it is properly installed and in proper operating order. Testing and checking shall be accomplished during the course of the work where required by work being concealed, and at the completion of the work otherwise. In

addition, the Contractor shall submit to the Owner's Representative a signed statement from each representative certifying as follows:

"I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations and are asbestos free."

1.20 OPERATING AND MAINTENANCE INSTRUCTION

A. The Contractor shall prepare for the owner's manual hereinafter specified complete sets of operating and maintenance instruction's, control and interlock diagrams, manuals, parts lists, etc. for each item of equipment. These are to be assembled as hereinafter specified for owner's manual.

B. In addition, the Contractor shall provide the service of a competent engineer or a technician acceptable to the Owner's Representative to instruct a representative of the Owner in the complete and detailed operation of all equipment and systems. These instructions shall be provided for a period of sufficient duration to fully accomplish the desired results. Upon completion of these instructions, a letter of release will be required, acknowledged by the Owner, stating the dates of instruction and personnel to whom instructions were given.

C. Additional diagrams, operating instructions, etc. shall be provided as specified hereinafter in the other sections of these specifications.

1.21 MATERIAL AND EQUIPMENT SCHEDULES

A. Contractor shall refer to both drawings and specification for schedules. Where reference is made to items "scheduled on drawings" or "scheduled in specifications," same shall include schedules contained in both the drawings and the specifications. The Contractor's attention is directed to the various specification sections and drawings for schedules.

1.22 APPLICABLE CODES AND STANDARDS

A. The installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of these specifications, except as may be hereinafter specifically modified in these specifications and associated drawings.
   1. National Fire Protection Association Standards (NFPA):
      a. NFPA No. 10, Portable Fire Extinguishers
      b. NFPA No. 54, National Fuel and Gas Code
      c. NFPA No. 70, National Electrical Code
      d. NFPA No. 101, Life Safety Code
      e. NFPA No. 255, Method of Test of Surface Burning Characteristics of Building Materials
   2. American National Standards Institute (ANSI):
      a. C.2, 1984 National Electrical Safety Code
      b. A117.1, Handicapped Code
   3. American Society of Mechanical Engineers (ASME): Section IV, V, CSD-1
   4. American Society of Testing Materials (ASTM): All applicable manuals and standards.
   5. National Electrical Manufacturers' Association (NEMA): All applicable manuals and standards.
   6. State Occupational Safety Act: All applicable safety standards.

7. Occupational Safety and Health ACT (OSHA): National Sanitation Foundation, Standard No. 2
8. Americans with Disabilities Act, 1990
9. American Gas Association (AGA)
10. Underwriters Laboratories, Inc. (UL)
11. Applicable State Building Codes (Uniform Building Codes, as amended):
12. All County codes related to mechanical, electrical, plumbing, and system equipment; piping; conduit; wiring; etc. furnished and installed under these specifications.
13. All City ordinances related to mechanical, electrical, plumbing, and systems and equipment; piping; conduit; wiring; etc. furnished and installed under these specifications.
14. Refer to specification sections heretofore bound for additional codes and standards.

B. All materials and workmanship shall comply with all applicable city, state, and national codes, specifications, and industry standards. All materials shall be listed by the Underwriters Laboratories, Inc. as conforming to its standards and so labeled in every case where such a standard has been established for the particular type of material in question.

C. The contract documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately notify the Owner's Representative in writing of said discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by Division 1 of these contract documents, providing no work or fabrication of materials has been accomplished in a manner of noncompliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules, and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations.

1.23 DEFINITIONS

A. Refer to the condition of the contract for Division 1 for additional requirements regarding definitions.

B. Where "as required" is used in these specifications or on the drawings, it shall mean "that situations exist that are not necessarily described in detail or indicated that may cause the Contractor certain complications in performing the work described or indicated. These complications entail the normal coordination activities expected of the Contractor where multiple trades are involved and new or existing construction causes deviations to otherwise simplistic approaches to the work to be performed. The term shall not be interpreted to permit an option on the part of the Contractor to achieve the end result."

C. Where "and/or" is used in these specifications or on the drawings, it shall mean "that situations exist where either one or both conditions occur or are required and shall not be interpreted to permit an option on the part of the Contractor.

D. Unless specifically indicated otherwise elsewhere in these specifications or on the drawings the word "furnish" or any of its derivatives shall be understood to indicate the purchase, delivery, storage and protection of an item at the job site in a location and manner suitable for use by the recipient who will be responsible for installation of this item. The word "install" or any of its derivatives shall be understood to indicate taking receipt of an item, properly mounting it, and providing the related utilities (electrical, communication, etc.) for proper and

complete operation of the item. Installation shall also include calibration, programming and operational testing of said item. The word “provide” or any of its derivatives shall be understood to indicate both furnishing and installing an item.

1.24 SUBSTANTIAL COMPLETION

A. Refer to Division 1 for additional requirements for substantial completion.

B. Substantial completion shall be defined as the level of project completion where the owner is ready to occupy the building. The contractor shall have ensured that all mechanical, electrical, plumbing, and building systems (elevators, automatic doors, hardware, security, etc.) are complete and in fully functional working order. This level of completion does not absolve the contractor from the requirements of final inspection or final acceptance. The contractor shall ensure there are no life safety issues unresolved with the project at the time of substantial completion.

C. All “punch” list items shall have been resolved or shall be identified as pending resolution. Items listed as unresolved shall be either pending information or direction from the owner or owners representative or shall be awaiting parts or supplies that are “on order”. The contractor at the owners discretion shall produce documentation of the part or supply on order status.

1.25 FINAL INSPECTION

A. Refer to Division 1 for additional requirements for final inspection.

B. It shall be the responsibility of the Contractor to personally conduct a careful inspection, assuring himself that the work on the project is ready for final acceptance and developing his own “punchlists,” before calling upon the Owner’s Representative to make a final inspection. Failure of the Contractor to conduct such inspections and provide the Owner’s Representative with a copy of his “punchlists” prior to the final inspection shall be adequate cause for the Owner’s Representative to cancel any Contractor-requested final inspection.

C. In order not to delay final acceptance of the work, the Contractor shall conduct his own “final inspections” prior to requesting the Owner’s Representative to “final” the project; will have all necessary bonds, guarantees, receipts, affidavits, etc. called for in the various articles of this specification prepared and signed in advance; and together with a letter of transmittal listing each paper included, shall deliver the same to the Owner’s Representative at or before the time of said final inspection. The Contractor is cautioned to check over each bond, receipt, etc. before preparing same for submission to see that the terms check with the requirements of the specifications.

D. The final inspection will be made jointly by the Owner’s Representative and the Owner.

1.26 REQUIREMENTS FOR FINAL ACCEPTANCE

A. Requirements for final acceptance shall include but not be limited to the Contractor accomplishing the following:
   1. Construction: Complete all construction.
   2. Deficiency Lists: Correct all deficiencies listed at time of Substantial Completion.
   3. Owner’s Manual: Submit at least 30 days prior to final acceptance one (1) copy of the owner’s manual for the Owner’s Representative’s review and comments. Following acceptance, prepare three (3) copies of bound and indexed owner’s manual, to be

delivered at the time of final acceptance, which shall include but not be limited to the following:

a. System operating instructions.
b. System control drawings.
c. System interlock drawings.
d. System maintenance instructions.
e. Manufacturers', suppliers', and subcontractors' names, addresses, and telephone numbers, both local representatives and manufacturers' service headquarters.
f. Equipment operating and maintenance instructions and parts lists.
g. Manufacturers' certifications (see Checking and Testing Materials and/or Equipment, this section).
h. Contractor's warranty.
i. Acceptance certificates of authorities having jurisdiction.
j. Log of all tests made during course of work.
k. Owner's acknowledgment of receipt of instruction, enumerating items in owner's manual.
l. List of manufacturers' guarantees executed by the Contractor.
m. Owner's acknowledgment of items of equipment or accessories indicated or specified to be turned over to Owner.

4. Instructions:
   a. Verbal, as herein specified.
   b. Posted, framed under glass or plastic laminated:
      1) System operating instructions.
      2) System control drawings.
      3) System interlock drawings.
5. Record Drawings: Deliver the specified record drawings to the Owner's Representative.

1.27 RECORD DRAWINGS

A. The Contractor shall maintain a set of contract drawings at the job site on which he shall indicate the installed locations of all equipment, electrical lighting, data drops, fire alarm devices, PA system devices, security devices, outlets, and electrical feeders. These drawings shall be used for reference or construction and shall not leave the field office. Upon completion of the work, the Contractor shall obtain and pay for Mylar's and/or disks (if available as CAD files) of the contract drawings from the Owner's Representative and transfer the above information to these Mylar's to provide "Record Drawings." The above-mentioned prints and "Record Drawings" shall then be delivered to the Owner's Representative. Refer to paragraph entitled "Record "Drawings" of the Supplemental General Conditions.

1.28 ALLOWANCES

A. Refer to Division 1 for allowances.

1.29 ALTERNATE PROPOSALS

A. Alternate proposals are summarized in Division 1 and on the bid proposal form. Refer to all sections of the specifications and the drawings to determine the exact extent and scope of the various alternate proposals as each pertains to the work of the various trades.

1.30 WARRANTY

A. General: All work performed (including equipment and materials furnished) under the various sections of these specifications shall be 100% warranted, for a period of one (1) year from the date of substantial completion thereof, against defective materials, design, and unauthorized substitution. Upon receipt of note of failure of any part of the guaranteed equipment and/or facilities during the guaranty period, the affected part(s) or facilities shall be replaced promptly with new parts, etc. by and at the expense of the Contractor. Further, the Contractor shall properly obtain, execute, and forward any and all manufacturer's warranties on equipment furnished under the Contract. Refer to Division 1 for additional requirements.

B. Extended Period: The Contractor shall provide all extended time warranties available from the manufacturer of the equipment provided as standard at no additional cost. This includes all extended warranties where specified with certain equipment as directed in other sections of this Specification.

1.31 SPARE PARTS

A. Spare Parts Data: As soon as practicable after approval of materials and equipment and, if possible, not later than four months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies with current unit prices and sources of supply, a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the Contract, and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation. The foregoing shall not relieve the Contractor of any responsibilities under the warranty specified.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. All materials, unless otherwise specified, shall be current United States manufacture, new, free from all defects, and of the best quality. Foreign goods specifically approved for use by the Owner's Representative prior to bidding may be furnished.

B. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by electricians skilled in their respective trades, and the installations shall present a neat, precise appearance.

C. The responsibility for the furnishing and intended installation of the proper electrical equipment and/or material as intended rests entirely upon the Contract. The Contractor shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

2.2 MATERIAL AND EQUIPMENT REQUIREMENTS

A. Manufacturer's Instructions: The manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufacturer materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Owner's Representative in writing of any conflict between the requirements of the Contract Documents and the manufacturer's direction and shall obtain the clarification of the Owner's

Representative before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such clarification by the Owner's Representative, he shall bear all costs arising in connection with the correction of the deficiencies.

B. Storage at Site: The Contractor shall not receive material or equipment at the jobsite until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage from surrounding work. All new or relocated equipment shall be stored inside or protected from the environment. Equipment that is not properly stored shall be replaced by the contractor at no cost to the owner.

C. Capacities shall be not less than those indicated and shall be such that no component or system becomes inoperative or is damaged because of startup or other overload conditions.

D. Conformance to Agency Requirements: Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriters Laboratories, Inc., or constructed and/or tested in accordance with the standards as listed in the NEC, the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of the Underwriters Laboratories, Inc. applied to the item will be acceptable as sufficient evidence that the items conform to such requirements.

E. Nameplates: Each major component of equipment shall have the manufacturer's name, address, and model-identification number embossed on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Inspection. All equipment starters and disconnects shall be tagged with the equipment designated mark and circuit.

F. Prevention of Rust: Standard factory finish will be acceptable on equipment specified by model number otherwise surfaces of ferrous metal shall be given a rust-inhibiting coating. The treatment shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking and no signs of rust creepage beyond 1/8 inch on either side of the scratch mark. Where rust inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable unless a specific coating is specified, except that coal tar or asphalt-type coatings will not be acceptable unless so stated for a specific item. Where steel is specified to be hot-dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-26915.

G. Protection of Connections: Switches, breaker handles, keys setscrews, handles and other parts not listed for normal occupied operation (light switches, etc.) shall be located accessible to but out of paths to prevent their accidental shutoff.

H. Verifications of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Owner's Representative of any discrepancy before performing any work. Adjustments to the work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner, Architect, or Engineer.

I. Standard Products: Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

2.3 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. No substitution of materials or equipment herein specified or called for on the drawings will be permitted, except by written permission of the Owner's Representative. Where several makes of equipment or material are mentioned, any item named may be bid upon provided it meets space, capacity specifications, finish, usage (switching, ballasts, similar operation), and looks and functions as what was specified.

B. Do not submit substitutions that do not match in whole what was specified or scheduled. Deviations from scheduled or specified items are installed at the contractors risk and are subject to replacement if the owner/engineer deems the product different from the specified item.

C. If the specified item is no longer available, it is the contractors responsibility to contact the architect/engineer and notify that the item is not available and suggest a suitable substitution that matches in whole the form, function, and appearance of the scheduled or specified item.

D. Refer to Conditions of the Contract and Division 1 for additional requirements regarding substitutions.

2.4 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS

A. Plenum cable, conduit, insulation, equipment support and mounting hardware, tapes, adhesives, core materials, jackets, and other materials in concealed locations, including any above-ceiling area, shall have a flame spread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating no higher than 50. Flame spread and smoke developed ratings shall be in accordance with NFPA Standard No. 255.

2.5 MOTORS

A. The Contractor shall provide all motors required for equipment supplied under each portion of the work. Motors shall be built in accordance with the latest ANSI, IEE, and NEMA standards, shall be fully coordinated with the equipment served, shall be of sizes and electrical characteristics scheduled.

2.6 STARTING EQUIPMENT

A. Each motor shall be provided with proper starting equipment. This equipment, unless hereinafter specified or scheduled to the contrary, shall be provided by the trade furnishing the motor. All motor starting equipment provided by any one trade shall be of the same manufacture unless such starting equipment is an integral part of the equipment on which the motor is mounted.

2.7 SLEEVES, INSERTS, AND FASTENINGS

A. General: Proper openings through floors, masonry walls, roofs, etc. for the passage of conduits shall be provided. All conduit through floors and walls must pass through sleeves, except conduit that is cast-in-place. Sleeves shall be set in new construction before concrete is poured, as cutting holes through any part of the concrete will not be permitted unless acceptable to the Owner's Representative.

B. Materials: Sleeves shall be of standard weight galvanized iron pipe, except heavy-gauge galvanized iron sleeves may be utilized in concrete pours where acceptable to the Owner's

Representative for size and metal gauge. Sleeves in fittings, grade beams, and where pipes enter or leave the building or pass through concrete or masonry shall be Schedule 40 PVC along the pipe route from the underground installation to the insulating coupling installed above ground.

2.8 FOUNDATIONS

A. General: All special foundations and supports required for the proper installation of equipment and pipe shall be provided as hereinafter specified and under the section of the specifications covering the equipment, unless otherwise indicated on the drawings.

B. Concrete foundations for the support of equipment such as floor-mounted transformers, switchgear, equipment, etc. shall be not less than 5 inches high and 4 inches beyond the equipment, unless otherwise noted, and shall be poured in forms built of new dressed lumber. All corners of the foundations shall be neatly chamfered by means of sheet metal or triangular wood strips nailed to the form. Foundation bolts shall be placed in the forms when the concrete is poured, the bolts being correctly located by means of templates. Allow 1 inch below the equipment bases for alignment and grouting. Foundations for equipment located on the exterior of the building shall be provided as indicated. Foundations shall be constructed in accordance with approved shop drawings and shall be reinforced with #4 bars at 12 inches on center both ways (minimum). Refer to Division 3: Concrete Work for materials, placement, etc. Coordinate with the equipment manufacturer for heavy (greater than 1000 pounds) pieces of equipment.

2.9 ACCESS DOORS

A. General: Provide wall, ceiling, or duct access doors for unrestricted access to all concealed items of electrical equipment.

B. Manufacturers shall be Inland-Milcor, Bilco, Miami Carey, or approved equal.

C. UL labeled when in fire-rated construction, one and one-half hour rating.

D. Equipment access doors shall be of sufficient size to remove/replace equipment and provide routine maintenance as necessary, unless otherwise noted. All doors shall have wedge-type latches except where cylinder locks are otherwise indicated or specified. Doors shall be set flush with adjacent finish surfaces. Exterior doors shall be provided with cylinder locks.

E. Access doors into ductwork shall be 14-gauge insulated galvanized steel with 16-gauge galvanized gasketed steel frame and cam-type locks. Access door shall be a minimum of 12" $\times$ 12" in size.

2.10 CONDITION OF MATERIALS

A. All materials required for the installation of the electrical systems shall be new and unused. Any material or equipment damaged in transit from the factory, during delivery to premises, while in storage on premises, while being erected and installed, or while being tested, until time of final acceptance, shall be replaced by this Contractor without extra cost to Owner.

PART 3 - EXECUTION

3.1 SPACE AND EQUIPMENT ARRANGEMENTS

A. The size of electrical equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers will be acceptable, it is the responsibility of the Contractor to determine whether the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared when required by the Owner's Representative to indicate a suitable arrangement.

B. All equipment shall be installed in a manner to permit access to all surfaces.

3.2 LARGE APPARATUS

A. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

3.3 HOISTING, SCAFFOLDING, AND TRANSPORTATION

A. Provide hoisting and scaffolding facilities as required to set materials and equipment in place.

3.4 PROTECTION

A. The Contractor shall take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the uncompleted building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.

B. The Contractor shall protect existing facilities, the work of others, and the premises from any and all damages that may be made possible by the execution of work.

C. Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these specifications.

3.5 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

A. Each trade, subcontractor, and/or Contractor must work in harmony with the various trades, subcontractors, and/or Contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or Contractor must pursue its work promptly and carefully so as not to delay the general progress of the job. This Contractor shall work in harmony with Contractors working under other contracts on the premises.

B. It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the jobsite in a clean and safe condition. At the end of each day's work, each trade shall properly store all of its tools, equipment, and materials and shall clean its debris from the job. Upon the completion of the job, each trade shall immediately remove all of its tools, equipment, any surplus materials, and all debris caused by its portion of the work.

3.6 PRECEDENCE OF MATERIALS

A. These specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the several available spaces, and which will ensure complete and satisfactory systems. Each subcontractor and/or trade shall be responsible for the proper fitting of his material and apparatus into the building.

B. The work of the various trades shall be performed in the most direct and workmanlike manner without hindering or handicapping the work of other trades. Piping interferences shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Where space requirements conflict, the following order or precedence shall, in general, be observed:
1. Building lines.
2. Structural members.
3. Soil and drain piping.
4. Condensate drains.
5. Vent piping.
6. Supply, return, and outside air ductwork.
7. Exhaust ductwork.
8. HVAC water and steam piping.
9. Steam condensate piping.
10. Fire protection piping.
11. Natural gas piping.
12. Domestic water (cold and hot).
13. Refrigerant piping.
14. Electrical conduit.

3.7 CONNECTIONS FOR OTHERS

A. This Contractor shall rough-in for and make all electrical connections to all fixtures, equipment, machinery, etc. provided by others in accordance with detailed roughing-in drawings provided by the equipment suppliers, by actual measurements of the equipment connections, or as detailed.

B. After the equipment is set in place, this Contractor shall make all final connections and shall provide all required conduit, fittings, whips, connectors, etc.

C. The Mechanical Contractors will set in place, ready for connection, all motors to be provided under their Contracts. The Mechanical Contractors will furnish and deliver all starter and control equipment not shown in motor control centers for any motors which they furnish. The Mechanical Contractor shall be responsible for the complete installation of all automatic temperature control systems, including wire, conduit, and interlocking connections.

D. The Electrical Contractor shall connect all motors and shall set in place all control devices, furnishing supports if and as necessary, and shall furnish and install all interconnecting line voltage wiring and make all connections ready for operation between motors, starters, and disconnect switches, as required. The Electrical Contractor shall furnish and install all motor control centers, including breakers, starters, etc. The Contractor shall refer to the Mechanical drawings and specifications for his scope of the connections to equipment furnished under these Contracts.

3.8 INSTALLATION METHODS

A. Where to Conceal: All conduits shall be concealed in chases, walls, furred spaces, below suspended floors, or above the ceilings of the building unless otherwise indicated. All concealed conduit shall be run in a professional manner, and parallel or perpendicular to the building lines.

B. Where to Expose: In mechanical rooms, only where necessary, conduit may be run exposed. All exposed conduit shall be run in the neatest, most inconspicuous manner, and parallel or perpendicular to the building lines. Conduit shall be bent in a manner as to run parallel to other conduits and not cross at angles.

C. Support: All conduit shall be adequately and properly supported from the building structure by means of hangers or clamps to walls as herein specified.

D. Maintaining Clearance: Where limited space is available above the ceilings and below concrete beams or other deep projections, conduit shall be sleeved through the projection where it crosses, rather than hung below them, in a manner to provide maximum above-floor clearance. Sleeves shall be as herein specified. Approval shall be obtained from the Owner's Representative for each penetration.

E. All conduits, etc. shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All conduits run exposed in machinery and equipment rooms shall be installed parallel to the building lines. Conduits in furred ceilings and in other concealed spaces may be run at angles to the construction but shall be neatly grouped and racked indicating good workmanship. All conduit openings shall be kept closed until the systems are closed with final connections.

F. Special Requirements:
1. The Contractor shall study all construction documents and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of the extremely limited spaces. Where conflicts occur the Contractor shall meet with all involved trades and the Owner's Representative and resolve the conflict prior to erection of any work in the area involved.
2. All conduit not directly buried in the ground or installed outside shall be considered as "interior."
3. Prior to the installation of any ceiling material, gypsum, plaster, or acoustical board, the Contractor shall notify the Owner's Representative so that arrangements can be made for an inspection of the above-ceiling area about to be "sealed off." The Contractor shall give as much advance notice as possible up to ten (10) working days, but in no case less than five (5) working days.
4. The purpose of this inspection is to verify the completeness and quality of the installation of the electrical systems and any other special above-ceiling systems, such as data, fire alarm, security. The ceiling supports (tee bar or lath) should be in place so that access panel and light fixture locations are identifiable and so that clearances and access provisions may be evaluated.
5. No ceiling material shall be installed until the deficiencies listed from this inspection have been corrected to the satisfaction of the Owner's Representative.

3.9 CUTTING AND PATCHING

A. General: Cut and patch walls, floors, etc. resulting from work in existing construction or where made necessary by failure to provide proper openings or recesses in new construction.

B. Methods of Cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Owner's Representative. Impact-type equipment will not be used except where specifically acceptable to the Owner's Representative. Openings in concrete for pipes, conduits, outlet boxes, etc. shall be core drilled to exact size. **Determine location of embedded conduit and reinforcing bars prior to cutting.**

C. Restoration: All openings shall be restored to "as-new" condition under the appropriate specification section for the materials involved, and shall match remaining surrounding materials and/or finishes.

D. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc. shall be of the proper size and shape, and shall be installed in a manner acceptable to the Owner's Representative.

E. Plaster: All mechanical work in area containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.

F. Weakening: No cutting, boring, or excavating which will weaken the structure shall be undertaken.

3.10 SLEEVES, INSERTS, AND FASTENINGS

A. Sleeves: The minimum clearance between horizontal conduit and sleeve shall be ¼ inch, except that the minimum clearance shall be ½ inch where piping contacts the ground. Sleeves through floors shall extend ¾ inch above the floor; sleeves through walls and partitions shall be installed flush with exposed surfaces. Sleeves are not required for piping indicated to the cast-in-concrete slabs-on-fill.

B. Inserts: Suitable concrete inserts for conduit and equipment hangers shall be set and properly located for all conduit and equipment to be suspended from concrete construction.

C. Fasteners: Fastening of pipes, conduits, etc. in the building shall be as follows:
1. To wood members: by wood screws.
2. To masonry and concrete: by threaded metal inserts, metal expansion screws, or toggle bolts, whichever is appropriate for the particular type of masonry or concrete.
3. To steel: machine screws or welding (when specifically permitted or directed), or bolts.

D. Weatherproofing: The annular space between a conduit and its sleeve in exterior walls or through floor to below grade shall be filled with polyurethane foam rods 50% greater in diameter than the space as backing and fill material and made watertight with a permanent elastic polysulfide compound. Seal both surfaces of wall or floor with a fire-resistant sealant.

3.11 FLOOR AND CEILING PLATES

A. Except as otherwise noted, provide one-piece chrome-plated brass floor and ceiling plates (or escutcheons) around all pipes, conduits, etc. passing through walls, floors, or ceilings in any spaces, except underfloor and attic spaces. Plates shall be sized to fit snugly against the outside of the conduit. Plates will not be required for piping where sleeves extend ¾ of an inch above finish floor and are concealed. Plates shall be one piece.

3.12 FIRE AND SMOKE PARTITION, WALL, AND/OR FLOOR PENETRATIONS

A. Conduit passing through fire- or smoke-rated floors, partitions, walls, or other barriers within a UL-listed assembly which shall maintain the rating of the applicable wall, floor, partition, or barrier. Flexible conduit shall not be used in rated walls. Provide connections between “hard” pipe and flexible whips on either side of wall. Fireproof around conduits.

B. The Contractor shall review the architectural and structural drawings and determine the location of the fire-rated building elements. Where these elements are penetrated, UL-listed fire-rated penetration assemblies approved by the local authority shall be provided in accordance with the manufacturer’s instructions to obtain the required rating.

3.13 METAL BUILDING SYSTEMS/ELECTRICAL SUPPORTS

A. Metal building systems are required to be designed by the manufacturer to accommodate and support the electrical systems indicated on the electrical drawings and specifications.

B. The metal building systems manufacturer is required to provide the following:
   1. Framed openings through the roofs with supports, roof curbs, and flashings for roof-mounted equipment, fans, vents, and air intakes.
   2. Structural support for piping, conduits, and suspended equipment consisting of beam, joists, purlins, and/or blocking above and perpendicular to conduit routes and equipment hangers at intervals not to exceed 8 feet.
   3. Structural support for suspended ceilings and light fixtures, including associated raceways.

C. The electrical trade shall:
   1. Provide all routes, weights, installation heights, opening locations, etc. for all equipment, conduits, sleeves, etc. to the metal building system manufacturer and coordinate requirements for structural supports, hangers, attachments, etc. with the metal building systems manufacturer.
   2. Provide all supporting devices (hangers, attachments, brackets, cross beams, etc.) to attach to the metal building structural system.

3.14 CONDUIT SUPPORT

A. Conduit Support: All conduits throughout the building, both horizontal and vertical, shall be adequately supported from the construction to line of grade, with proper provision for expansion, contraction, vibration elimination, and anchorage. Vertical conduits shall be supported from floor lines with riser clamps sized to fit the lines and to adequately support their weight. At the bases of lines, where required for proper support, provide anchor base fittings or other approved supports.

B. Conduit shall not be supported from any other system.

3.15 HANGERS

A. General: Each hanger shall be properly sized to fit the supported pipe or to fit the outside of the insulation on lines where specified.

B. Attachment:

1. The load on each hanger and/or insert shall not exceed the safe allowable load for any component of the support system, including the concrete which holds the inserts. Reinforcement at inserts shall be provided as required to develop the strength required.
2. Where pipes are supported under steel beams, approved-type beam clamps shall be used.
3. Where conduit is supported under wood joists, hanger rods shall be attached to joists with side beam brackets or angle clips.

C. Spacing: All hangers shall be so located as to properly support horizontal lines without appreciable sagging of these lines. All PVC shall be supported at intervals recommended by the manufacturer, or as otherwise specified or indicated.

D. Trapezes: Where multiple lines are run horizontally at the same elevation and grade, they may be supported on trapezes of Kindorf, Elcen, or approved equal, channel-suspended on rods or pipes. Trapeze members including suspension rods shall each be properly sized for the number, size, and loaded weight of the lines they are to support.

E. Ceiling-Mounted Devices: All lighting and devices or assemblies mounted in lay-in-type ceilings and which are supported by the ceiling grid, directly or indirectly, and which weigh in excess of 2 lbs., shall be provided with at least two 12-gauge minimum wire supports connected securely between the device or assembly and the structure, to serve as a safety support in the event of the collapse of or a disturbance in the support of the ceiling system that might cause the device or assembly to fall through the ceiling. This includes, but is not limited to, light fixtures, J-boxes, and heavy speakers. Provide additional support as required where the weight of the device or assembly will exceed the safe limits of the wire supports.

F. Perforated strap iron or wire will not be acceptable as hanger material.

G. Miscellaneous: Provide any other special foundations, hangers, and supports indicated on the drawings, specified elsewhere herein, or required by conditions at the site. Hangers and supporting structures for suspended equipment shall be provided as required to support the load from the building structure in a manner acceptable to the Owner's Representative.

3.16 ACCESS DOORS

A. Provide in walls, floors, and ceilings to permit access to all equipment and piping requiring service or adjustment. Examples of such equipment needing access are disconnects, actuators, contacts, and equipment needing periodic or replacement maintenance.

B. Use panels equal to Milcor Style M for masonry and drywall construction, equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile.

C. Access doors located outside or in a moisture-laden environment (e.g., toilet room, dressing area, shower area, etc.) shall be stainless steel.

3.17 ROOF PENETRATIONS AND FLASHING

A. The contractor shall obtain from the Owner all warranty requirements for new or existing roofing systems and shall have all work on roof penetrations, curbs or equipment supports performed by a subcontractor acceptable to the Owner and the new or existing roofing system installer and manufacturer in order that all roofing system and materials warranties are preserved.

B. Pipe and conduit ducts, pitch pockets, curb bases, and flashing compatible with the roofing installation shall be provided for roof penetrations. Provide framing or other support around all openings through roof as required to preserve the structural integrity of the roof system and make the penetration weathertight.

C. Roof curbs for all roofs except standing seam metal roofs shall be provided by the equipment supplier supplying the roof-mounted equipment, etc., and such curbs shall be installed by the roofing trades. Contractor shall coordinate all roof curb requirements with all trades and the roofing trades at the earliest possible stage of the project.

D. Roof curbs for standing seam metal roofs shall be provided by the roofing trades. Curb base size, height, and type shall be coordinated with the roofing trades at the earliest possible stage of the project.

E. Flashing for pipe and conduit penetrations of standing seam metal roofs shall be provided and installed by the roofing trades.

F. See Division 7: Thermal and Moisture Protection for metal roof curbs, flashing, etc.

3.18 ROOFTOP EQUIPMENT

A. Install all starters and disconnects within 5 feet of equipment being served.

B. Mount starters and disconnects on the equipment only if allowed or recommended by the manufacturer. Otherwise, mount disconnects on unistrut-style framing in an “L” configuration. Secure unistrut to roof with a flashed wood nailer. Provide cross bracing.

C. Run “hard” conduit (IMC) through conduit curb to starter or disconnect. Install IMC from starter or disconnect to equipment. Flexible watertight conduit is acceptable only for equipment on a vibration-type (spring) curb or that has movement. This does not include AHU, chillers, fans on factory non-spring curbs, package units, or other internally isolated rooftop equipment.

3.19 TESTS AND INSPECTIONS

A. Refer to conditions of the contract and Division 1 for additional requirements regarding tests and inspections.

B. General: The Contractor shall make all tests deemed necessary by the inspection departments of the authority having jurisdiction, Board of Underwriters, etc. He shall provide all equipment, materials, and labor for making such tests. Fuel and electrical energy for system operational tests following beneficial occupancy by the Owner will be paid for by the Owner.

C. Other: Additional tests specified hereinafter under the various specifications sections shall be made.

D. Notification: The Owner’s Representative shall be notified at his office 36 hours prior to each test and other specifications requirements requiring action on the part of the Owner, Architect, Engineer, and/or Owner’s Representative.

E. Test Logs: All tests which the Contractor conducts shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel, description and extent of system tested, test conditions, test results, specified results, and any other pertinent

data. Data shall be delivered to the Owner's Representative as specified under "Requirements for Final Acceptance.

F. Inspections: In general, an inspection by the Owner's Representative shall be required prior to closing up any work and prior to beneficial occupancy or final project completion. The closing up of work includes, but is not limited to, conduit installations prior to backfilling; electrical and fire protection work prior to placement of concrete; or closing up walls and overhead electrical and fire protection work prior to installation of the ceiling.

3.20 CLEANING AND PAINTING

A. The contractor shall at all times keep the premises free from accumulations of waste material or rubbish. Debris shall be removed from the site and from any street or alley adjacent to the site.

B. Thoroughly clean and touch up the finish on all parts of the materials and equipment. Exposed parts in equipment rooms, and all other spaces except sealed chases and attics shall be thoroughly cleaned of cement, plaster, and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

C. Exposed metal work which is not galvanized shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean and then painted with a suitable rust resistant primer. Exposed metal work includes work exterior to the building; exposed in mechanical or electrical equipment rooms and storage rooms; and other areas where occupants could see the work, whether normally occupied or not.

D. All other painting shall be accomplished under the Painting Section of Division 9 of the specifications.

E. At completion of the project, the Contractor shall remove all tools, scaffolding, and surplus materials. Contractor shall leave the area "broom clean". Before final acceptance, vacuum all panels, switchboards, starters, and other electrical devices. Wipe clean all fixture lenses and reflectors, all panelboard and switchboard interior and exterior surfaces, being careful to remove all stray paint, construction materials, dust, and particles. Touch-up all marred surfaces to restore existing conditions to those provided by the manufacturer.

3.21 IDENTIFICATION AND LABELING

A. General: The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, disconnects, panels, etc. by marking them. All disconnects/starters/panels shall be labeled for the equipment they serve. Marks shall be the same as the drawings.

3.22 COORDINATION OF WORK

A. The light fixture grid layout as indicated on the drawings must be maintained. This Contractor shall refer to all light fixture plans and details indicated on the drawings.

B. The electrical trades shall locate all junction boxes, pull boxes, conduits, etc. to avoid interference with the diffusers, dampers, grilles, etc. The mechanical trades shall furnish to all other trades copies of approved ductwork shop drawings to assist in the coordination of the rough-in and installation of all items of work.

C. The order of space allocation priority in plan and in elevation shall be as follows.
   1. 1st Light Fixtures, at Ceiling Soffit + 6"
   2. 2nd Grade Plumbing Waste and Vent Systems
   3. 3rd Ductwork
   4. 4th Pressurized Piping Systems
   5. 5th Electrical Conduit
   6. 6th Ceiling Support System, where required

3.23 DISCHARGE OF WASTES FROM CONSTRUCTION SITE

A. The Contractor shall comply with all applicable provisions of local, state, and federal laws regarding the discharge of wastes into sewer and waterways. Special caution shall be exercised to prevent the discharge of wastes which contain oil, tar, asphalt, roofing compound, kerosene, gasoline, paint, mud, cement, lime, or other materials which would degrade the water quality of the receiving water course.

B. Disposal of Lamps and Ballasts: The proper disposal of all ballasts and lamps from the demolition of lighting fixtures as part of this project will be the responsibility of the Electrical Contractor. All lamps and ballasts found to contain hazardous contaminants will be removed from the site and transported to a licensed disposal facility by a contractor licensed in this field. All work shall be performed in accordance with current state and Federal rules and regulations pertaining to the processing of contaminated waste materials. A certificate of proper disposal from the licensed waste contractor shall be provided to the Engineer.

3.24 OPERATING AND MAINTENANCE MANUAL

A. The Contractor shall furnish indexed operating and maintenance manuals with complete technical data for each electrical system, piece of equipment, and material installed under this Contract.

B. The manuals shall be identified on the cover as “Operating and Maintenance Manual” and shall list the name and location of project, the Owner, the Engineers, the General Contractor, and the Subcontractors installing equipment represented in the brochure.

C. Two (2) copies of the manual, bound in three-ring hardback binders shall be provided. One copy shall be completed and delivered to the Engineer prior to the time that system and equipment tests are performed. The second copy shall be delivered prior to final acceptance. The manual shall have a Table of Contents and shall be grouped in tabbed sections according to the specification sections. Each section shall be organized as follows:
   1. Approved engineering submittals with complete performance and technical data.
   2. Manufacturer’s local representative and/or distributor's name and address.
   3. Manufacturer’s installation instructions and brochures.
   4. Manufacturer’s operating and maintenance brochures.
   5. Manufacturer’s installation wiring diagram.
   6. Contractor’s field wiring diagram, if different.
   7. Manufacturer’s brochure listing recommended spare parts.
   8. Manufacturer’s brochure listing replacement part numbers and descriptions.

D. Provide a final section entitled, “Warranties and Guarantees”, for all equipment as well as Contractor’s warranty.

3.25 CONDITIONS OF EQUIPMENT AT FINAL ACCEPTANCE

A. At the time of acceptance, the Contractor shall have inspected all installed systems to assure the following has been completed:
   1. Fixtures are operating, and lenses and reflectors are free of dust, debris, and fingerprints.
   2. Panelboards have all conductors neatly formed, bundled, and made-up tight. Cans shall be vacuum cleaned and surfaces cleaned of stray paint, dust, grease, and fingerprints. All circuit directories to be neatly typed and in place.
   3. Wall plates and exposed switch and receptacle parts to be clean, free of paint, plaster, etc.
   4. Safety and disconnect switches and motor starters to be vacuum cleaned of debris and dust, and all surfaces free of stray paint, grease, and fingerprints.
   5. Switchgear, transformers, and system devices shall be cleaned internally and externally and have all surfaces restored to original surface conditions.
   6. Touch-up all scratched surfaces using paint matching the existing equipment paint. Where paint cannot be matched, the entire surface shall be repainted in a color and manner approved by the Engineer.

END OF SECTION

SECTION 26 0050

BASIC ELECTRICAL 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:
1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electricity-metering components.
5. Concrete equipment bases.
6. Electrical demolition.
7. Cutting and patching for electrical construction.
8. Touchup painting.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For electricity-metering equipment.

B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devised, 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.

1.6 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow:
   1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.
   1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
   2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section “Access Doors.”

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. See Section “Raceways and Boxes.”

2.2 CONDUCTORS

A. See Section “Conductors and Cables.”

2.3 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.

D. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least one surface.
   1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
   2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

E. Raceways and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

H. Expansion Anchors: Carbon-steel wedge or sleeve type.

I. Toggle Bolts: All-steel springhead type.

J. Powder-Driven Threaded Studs: Heat-treated steel.

2.4 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transforming Cabinets: Comply with requirements of electrical power utility company.

B. Meter Sockets: Comply with requirements of electrical power utility company.

C. Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections complete with interconnecting buses.
   1. Housing: NEMA 250, Type 3R enclosure
   2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit breakers in downstream panelboards that have 10,000-A interrupting capacity, minimum.

D. Provide power utility company communication conduit to meter.

E. Relocate communication conduit with meter as required to maintain minimum utility company clearances.

2.5 EQUIPMENT FOR ELECTRICITY METERING BY OWNER

A. Meter: Electronic kilowatt-hour/demand measuring to record electricity used and highest peak demand over a time period according to electric utility. Meter is designed for used on the type and rating of circuit indicated for its application.
   1. Kilowatt-Hour Display: Digital liquid crystal.
   2. Kilowatt-Demand Display: Digital, liquid-crystal type to register highest peak demand.
   3. Enclosure: NEMA 250, Type 1, Minimum, with hasp for padlocking or sealing.
   4. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.

5. Sensors: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for the ratings of the circuits indicated for this application.
   a. Type: Solid core.
6. Accuracy: Nationally recognized testing laboratory certified to meet ANSI C12.16 specifications.
7. Demand Signal Communication Interface: Match signal to building automation system input that conveys data on instantaneous/integrated demand level measured by meter used for load switching to control demand.

B. Current-Transformer Cabinets: Listed or recommended by metering equipment manufacturer for use with sensors indicated.

C. Available Metering Equipment Manufacturers: Subject to compliance with requirement, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. E-MON Corporation.
2. National Meter Industries, Inc.
3. Osaki Meter Sales, Inc.

2.6 CONCRETE BASES

A. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section “Cast-in-Place Concrete.”

2.7 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer’s paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. Mount all non-wall mounted equipment minimum of:
1. Two (2) inches off the wall for switchboards, free standing distribution boards, disconnects, panels and all other non-vibrating equipment.
2. Minimum of four (4) inches for vibrating equipment to include transformers.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install ¼-inch-diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1½ inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and

fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.
   a. Field Welding: Comply with AWS D1.1.
6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.5 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 6 inches larger, in both directions, than supported unit and bollards.

B. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Sections "Cast-in-Place Concrete," "Concrete Reinforcement," and "Concrete Formwork."

C. Bollards: Provide bollards around utility provider pad mount transformer. Protect equipment on road or driveway sides.

D. Provide bollards around owner genset if within 10 feet of roadway.

E. Provide 36 inch concrete pads in front of exterior switchboards full length of switchboard.

F. Provide 30 inch concrete pads in front of ground mounted disconnect racks.

3.7 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.9 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:
1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

B. Test Owner’s electricity-metering installation for proper operation, accuracy, and usability of output data.
1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
2. Turn off circuits supplied by the metered feeder and secure them in the “off” condition.
3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.10 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section “Painting.”
   1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   2. Follow paint manufacturer’s written instructions for surface preparation and for timing and application of successive coats.
   3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.11 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 26 0519

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

B. Related Sections include “Control/Signal Transmission Media” for transmission media used for control and signal circuits.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field Quality-Control Test Reports: From Contractor.

1.4 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 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, all conductors shall be listed for the application, temperature, and insulation rating to which they are intended.

2.2 CONDUCTORS AND CABLES

A. Refer to Part 3 “Conductor and Insulation Applications” Article for insulation type, cable construction, and ratings.
B. Conductor Material:
   1. Copper complying with NEMA WC 5 or 7.
   2. Solid conductors, sizes 10 and 12, uncoated copper per ASTM B3.

3. Stranded conductor, all other sizes, uncoated copper per ASTM B3, ASTM B787, and ASTM B8.

C. Conductor Insulation Types: Type THHN-THWN and complying with NEMA WC 5 or 7.
1. Rated for sunlight resistance all colors.
2. Conductors shall be color coded for voltage and phase as per NEC and any local amendments.
3. Larger conductors shall have taped color coding.
4. Size, rating, temperature, and type shall be permanently marked on conductor jacket.
5. Insulation shall be PVC, heat and moisture resistant, flame retardant compound as per UL-83 and UL-1063.
6. Jacket shall be polyamide outer nylon covering per UL-83 and UL-1063.

D. Rated for sunlight resistance all colors.

2.3 CONNECTORS

A. Wire Connectors:
1. Description: Factory-fabricated UL listed connected and of size, ampacity rating, material, type, and class for application and service indicated.
2. Provide self-locking square wire spring grab screw on wire connectors sized as per NEC and the number of conductors to be connected.
3. Thermoplastic deep shell design, with wings on smaller connectors, rated for application temperature, Minimum 105 degrees C.
4. Copper to copper connection, 600V.
5. Provide high temp wire connectors for all high temperature equipment applications.

B. Push-in wire connectors are **Not Approved** and shall not be used for any power or lighting circuits above 50V.

2.4 ALTERNATES

A. Blue Jacketed steel MC Cable is only permitted for 6 foot (maximum) lighting whips. It shall be used for **no** other purpose.

B. AC cable is **not** permitted at all.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, suitable for use in air return plenums.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: 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 and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Underground Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

J. Fire Alarm Circuits: Power-limited, fire-protective, signaling circuit cable.

K. Class 1 Control Circuits: Type THHN-THWN, in raceway.

L. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Minimum line voltage conductor size is #12.

C. Neutrals shall not be shared on any single pole circuit.

D. 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.

E. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

F. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

G. Support cables according to Section “Basic Electrical Materials and Methods.”

H. Seal around cables penetrating fire-rated elements according to Section “Through-Penetration Firestop Systems.”

I. Identify and color-code conductors and cables according to Section “Electrical Identification” and adhere to local color code requirements.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturers 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.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
   1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
   2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. 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.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING

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 grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections include Section “Lightning Protection” for additional grounding and bonding materials.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For firms and persons specified in “Quality Assurance” Article.

C. Field Test Reports: Submit written test reports to include the following:
   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.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
   1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association 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.
   1. Comply with UL 467.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Grounding Conductors, Cables, Connectors, and Rods:
      a. Apache Grounding/Erico Inc.
      b. Boggs, Inc.
      c. Chance/Hubbell.
      d. Copperweld Corp.
      e. Dossert Corp.
      f. Erico Inc.; Electrical Products Group.
      g. Framatome Connectors/Burndy Electrical.
      h. Galvan Industries, Inc.
      i. Harger Lightning Protection, Inc.
      j. Hastings Fiber Glass Products, Inc.
      k. Heary Brothers Lightning Protection, Co.
      l. Ideal Industries, Inc.
      m. ILSCO.
      n. Kearney/Cooper Power Systems.
      o. Korns: C.C. Korns Co.; Division of Robroy Industries.
      p. Lightning Master Corp.
      q. Lyncole XIT Grounding.
      r. O-Z/Gedney Co.; a business of the EGS Electrical Group.
      s. Raco, Inc.; Division of Hubbell.
      t. Robbins Lightning, Inc.
      u. Salisbury: W.H. Salisbury & Co.
      v. Superior Grounding Systems, Inc.
      w. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section “Conductors and Cables.”

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Bare Copper Conductors: Comply with the following:
   1. Solid Conductors: ASTM B 3.
   2. Assembly of Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.

H. Copper Bonding Conductors: As follows:
   1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, ¼ inch in diameter.
   2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1_inches wide and 1/16 inches thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1_inches wide and 1/16 inches thick.

I. Ground Conductor and Conductor Protector for Wood Poles: As follows:
1. No. 4 AWG minimum, soft-drawn copper conductor.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

J. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

B. Ground Rods: Sectional type; copper-clad steel.
1. Size: ¾ by 120 inches.

C. Test Wells: Provide handholes for test wells.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel, ground rods, and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

G. Underground Grounding Conductors: Use tinned-copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

D. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

E. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding 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. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

H. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

I. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

J. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

K. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, 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.
   1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a ¼-x2x12-inch grounding bus.

2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

L. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

M. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

3.3 COUNTERPOISE

A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches below grade and 24 inches from building foundation.

3.4 INSTALLATION

A. Ground Rods: 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.
   1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
   2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide 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 by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

H. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.5 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
   2. Make connections with clean, bare metal at points of contact.
   3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
   4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
   5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturers published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by

connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Duct Banks: Install a grounding conductor with at least 50 percent ampacity of the largest phase conductor in the duct bank.

B. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.7 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:
   1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
   2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the 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. Perform tests, by the fall-of-potential method according to IEEE 81.
   3. Provide drawings locating each 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.
      a. Equipment Rated 500 kVA and Less: 10 ohms.
      b. Equipment Rated 500 to 1000 kVA: 5 ohms.
      c. Equipment Rated More Than 1000 kVA: 3 ohms.

d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
e. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.8 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

SECTION 26 0533

RACEWAYS AND BOXES

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 raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:
1. Division 7 Section “Firestopping” for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
2. Section “Basic Electrical Materials and Methods” for supports, anchors, and identification products.
3. Section “Wiring Devices” for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

H. PVC-GRS: PVC-Coated galvanized rigid steel.

1.4 SUBMITTALS

A. Product Data:
1. For surface raceways, wireways and fittings.
2. Floor boxes.
3. Hinged-cover enclosures and cabinets.
4. Conduit spacers.
5. Conduit rack supports.

B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

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.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

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. Refer to 3.1, RACEWAY APPLICATION, for materials to be used.

2.2 METAL CONDUIT AND TUBING

A. Available Manufacturers:
1. AFC Cable Systems, Inc.
2. Alflex, Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. Republic Conduit.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.
10. Perma-Cote
11. Plasti Bond
12. KorKap

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. PVC--Coated Steel Conduit and Fittings: UL514b NEMA RN 1.

E. PVC- Coated IMC and Fittings: ETL PVC-001 NEMA RN 1 UL6.

F. EMT: ANSI C80.3.

G. FMC: Zinc-coated steel. Non UL listed FMC is not allowed for any line voltage (greater than 70V) system.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings: NEMA FB 1; compatible with conduit and tubing materials. Provide fittings factory matched with conduit types.
   1. Indoor Fittings: Steel Set Screw or Steel Compression
   2. Outdoor Fittings: Threaded fittings on IMC or Rigid Conduit
   3. Outdoor Fittings: Compression fittings with gaskets on all transitions to flexible conduit.
   4. Die cast fittings are not acceptable anywhere.
   5. Provide factory fittings with MC cable where allowed.
   6. EMT crimp type fittings are not acceptable.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers:
   1. American International.
   2. Anamet Electrical, Inc.; Anaconda Metal Hose.
   3. Amco Corp.
   4. Cantex, Inc.
   5. Certainteed Corp.; Pipe & Plastics Group.
   6. Condux International.
   7. ElecSYS, Inc.
   8. Electri-Flex Co.
   9. Lamson & Sessions; Carlon Electrical Products.
   10. Manhattan/CDT/Cole-Flex.
   11. RACO; Division of Hubbell, Inc.
   12. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. LFNC: UL 1660.

E. Fittings: NEMA TC 3; match to conduit or tubing type and material. Provide fittings factory matched with conduit types.
   1. Indoor/Outdoor Fittings: Compression.
   2. Outdoor Fittings: Compression fittings with gaskets on all transitions to flexible conduit.

2.4 METAL WIREWAYS

A. Available Manufacturers:
   1. Hoffman.
   2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.

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. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged type, or as indicated.

F. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Available Manufacturers:
   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. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. 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.

E. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
   1. Available Manufacturers:
      a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
      b. Thomas & Betts Corporation.
      c. Walker Systems, Inc.; Wiremold Company (The).
      d. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
   1. Available Manufacturers:
      a. Butler Manufacturing Co.; Walker Division.
      b. Enduro Composite Systems.
      c. Hubbell, Inc.; Wiring Device Division.
      d. Lamson & Sessions; Carlon Electrical Products.
      e. Panduit Corp.
      f. Walker Systems, Inc.; Wiremold Company (The).
      g. Wiremold Company (The); Electrical Sales Division.

C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

D. Provide raceway base, cover, base coupling, coupling covers, angle fittings, end caps at ends, and entrance end fittings. Provide divider wall throughout raceway. Provide device

brackets and snap-on bezels at all devices shown on drawings. Provide blank covers at all non-used bezels.

E. Provide raceway full length, mounted as per drawings or 6" above counters if height is not indicated, as shown on drawings. Provide elbows and raceway to 6 inches above ceiling if risers are indicated on the drawings.

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/ Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Stahlin
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
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. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

H. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.8 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

B. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:
1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground Secondary, Single Run: PVC Schedule 40 with long radius elbows.
4. Underground Secondary, Grouped: PVC Schedule 40 with long radius elbows.
5. Underground Primary: PVC Schedule 80 with long radius elbows.
6. Primary Risers: PVC Schedule 80. With long radius elbows.
7. Underground Data: PVC Schedule 40 with long radius elbows.
8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
9. Boxes and Enclosures: NEMA 250, Type 3R.
10. Under Canopies: IMC with sealed fittings.
11. Penetrations though exterior walls: RMC or IMC
12. Embedded in Concrete: Only in Approved locations – wrapped RMC or IMC.
13. Coastal or Corrosive Locations or where specifically indicated on drawings: ETL PVC-001 PVC-GRS

B. Indoors:
1. Exposed in Mechanical/Electrical/Unfinished Spaces: EMT.
2. Exposed in Finished Spaces: Metal Surface Raceway painted/finished to match space finishes.
3. Concealed: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFNC in damp or wet locations or with water equipment.
5. Damp or Wet Locations: Sealed EMT with sealed fittings.
6. Underfloor: Sealed EMT with sealed fittings or IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.

C. Minimum Raceway Size: 1/2-inch for single 20A or less circuits; otherwise, 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating using the manufacturer's PVC touch up compound after installing conduits.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz.

F. Aluminum conduit will not be accepted on this project.

3.2 INSTALLATION

A. Conduit Routing:
1. All branch circuit conduit shall be run overhead unless specifically directed by the engineer.
   a. Exceptions:

1) Conduit to floor boxes.
2) Conduit to locations otherwise inaccessible overhead (exposed or not).
3) Conduit to exterior slab locations without overhead cover.
4) Conduit to column mounted lighting, devices, or equipment inaccessible from above.

2. Panel feeder conduits may be run in the floor or underfloor ONLY IF indicated on the drawings or directed by the engineer.
3. Service secondary conduits may be run underfloor or in-ground.
4. Conduit for exterior equipment or lighting may be run underfloor or in-ground.
5. All conduit serving any equipment or devices (to include panels, transformers, and switchboards, or any other electrical distribution equipment) within the perimeter of the building shall be run within the perimeter of the building. Conduit shall not run across courtyards or underground from one section of the building to another section of the contiguous building.
   a. Exception: Service entrance conduit.
6. All conduit shall be run at right angles or parallel to the building lines to the limits that the structure will allow. Raceways shall not be run diagonal or curved.

B. Installation of the PVC Coated Conduit System shall be performed in accordance with the Manufacturer's Installation Manual. To assure correct installation, the installer shall be certified by Manufacturer to install coated conduit

C. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

D. Install raceways as high as possible and coordinate installation with other equipment.

E. Install raceways to equipment mounted on the floor away from walls from overhead down to the equipment or disconnects. Do not run across the floor creating a tripping hazard. Rack support conduit at the disconnect.

F. Provide clear access to all pull and j-boxes. Provide access doors over hard (non-lay-in ceilings) to all pull boxes. Minimum access required 1.5 x box cover size or 18 inches.

G. Label all j-box and pull box covers with circuits contained within box.

H. Under no circumstances shall power and data be shared in the same raceway, tray, channel, or sleeve.

I. Install raceways for power conductors (any conductor over 50V) 12 inches from any signal/communications conductor (data, fiber optics, telephone, fire alarm, PA, community antenna and radio distribution (CATV), low power or network powered broadband communications, systems controls, and any other system operating under 50V) not in conduit on J-hooks.

J. Install raceways for power conductors (any conductor over 50V) 12 inches from communications raceways. Communications raceways include; data, fiber optics, telephone, fire alarm, PA, community antenna and radio distribution (CATV), low power or network powered broadband communications, systems controls, and any other system operating under 50V.
   1. Exception: Data and power raceways shall be permitted to be 2 inches apart only at the wall drop to the devices. Above the ceiling or overhead the minimum 12 inch spacing shall be maintained.
   2. Exception: Within the surface raceways. When not within the surface raceway, the power and communications raceways shall be 12 inches apart.

3. Underground: Data and power conduit/raceway shall be allowed in the same trench only if specifically allowed by the engineer and then there shall be a minimum of 12 inches of fill between the power and communications raceways. Magnetic marking tape shall be placed above the level of the highest (closest to grade) raceway.

K. Exterior Exposed Raceways:
1. See application schedule for raceway types.
2. Provide non-flexible raceways through roofs to disconnects, panels, or receptacles as per application schedule.
3. Provide transitions from non-flexible raceways to flexible raceways within 3 feet of the equipment.
   a. Exception: Flexible raceways may exceed 3 feet only to accommodate the drip legs.
4. Penetrate roofing membranes with approved methods only for the type of roof used. See roofing or architectural details.
5. Provide chem-curbs on built-up roofs unless otherwise directed from roofing or architectural details.
6. Support all exposed raceway on roofs with manufactured neoprene blocks with integral galvanized channel, conduit hangers as part of a manufactured assembly with galvanized channel (portable pipe hangers or equal), or approved method as per architectural.
7. Exposed raceways on roofs shall not be unsupported in any areas nor attached directly to the roof.
8. Provide roof hoods for multiple conduits through roofs as indicated.
9. Provide drip legs for all exterior exposed raceways from disconnects to equipment.

L. Buried Raceways:
1. See application schedule for raceway types.
2. Label all buried conduits.
3. Provide spacers between all buried conduits for a neat and uniform installation. Conduit shall not be “stacked” on top of each other without manufactured spacers.
4. IF telecommunications conduits and power conduits (only under 600V) are allowed in the same trench by owner or engineer, provide a minimum of 12 inches of compacted earth between the conduit racks. Provide magnetic marking tape between the communications conduits and the power conduits.
5. Under NO circumstances shall power conduits over 600V be in the same trench as the communications conduits.
6. All communications conduits shall have long radius elbows 10x the conduit diameter, but no less than 30”, rising up into the building or communications equipment.
7. Provide concrete encasement for all primary building feeders unless directed by utility company.
8. Provide concrete encasement for all secondary building feeders unless otherwise noted.
9. Provide pull strings/tape (per size and distance) for all empty conduits.
10. Minimum depth of primary or medium voltage conduits 42 inches. (600V and above).
11. Minimum depth of secondary or low voltage conduits 30 inches. (0 to 600V).
12. All 90 degree changes in direction shall be long radius.
13. Provide metal backed marking tape at 12 inches below grade and 6 inches above all buried raceways.
14. Clean and swab out all conduits prior to installing conductors.
15. Any metallic conduit coming in contact with earth, insulate with approved tape or asphalt paint.

M. All underfloor conduits shall be supported as per NEC.
1. See application schedule for conduit types.

2. All conduit supports shall be anchored to structure.
3. Provide support for multiple conduits with galvanized kindorf rack, conduit straps, all thread rod to angles, and mount angles to structure.
4. ONLY IF specifically directed by owner or engineer to use RNC underfloor;
   a. Provide support for 2" and below conduit every 48 inches.
   b. Provide support for 2-1/2" and above every 60 inches.

N. Complete raceway installation before starting conductor installation.

O. Support raceways as specified in Section “Basic Electrical Materials and Methods.”

P. Install temporary closures to prevent foreign matter from entering raceways during construction. Remove prior to completion of conduit.

Q. Sleeves: Provide metallic raceway sleeves through walls or floors for all conductors/cabling not in raceways. Provide bushings at both ends of sleeves prior to installing any conductors or wiring. Firestop as per requirements.

R. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

S. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

T. Firestop: Firestop all raceway penetrations in rated walls. Provide intumescent fill in all sleeve openings. Contractor shall be responsible for all wall repair and damage. Excessive firestop for holes too large (½ inch beyond the edge of the raceway) is unacceptable. Holes shall be repaired with suitable wall materials to maintain the integrity of the wall construction.

U. Cut openings in walls as per the outer edges of the raceway. Openings made with hammers or other wall damaging tools are not acceptable. Holes too large (½ inch beyond the edge of the raceway) are unacceptable and shall be repaired with suitable wall materials to maintain the integrity of the wall construction. Contractor shall be responsible for repair to match existing.

V. Provide manufactured elbows of conduit type specified for PVC raceways. Field constructed elbows are not allowed. Rigid Non-metallic tubing shall not have any field fabricated 90 degree bends. Provide manufactured elbows at all 90 degree changes in direction.

W. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
   1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

X. Raceways Embedded in Slabs are allowed ONLY where specifically called out or ALLOWED by structural and electrical engineer: Install in middle one-third of slab thickness where practical and leave at least 2 inches of concrete cover on the top and bottom.
   1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
   2. Space raceways laterally to prevent voids in concrete.
   3. Run raceways parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

Y. Expansion Joints: Provide flexible connections suitable for use with conduit type for all conduit in structural expansion joints or independent slabs that are within another structural assembly.

Z. Raceways Through Slabs to Interior Spaces: Install where practical and leave at least 2 inches from any walls unless required to come up in the wall. Coordinate with grade or perimeter beams prior to installation.
1. Secure raceways to concrete with conduit clamps.
2. Change from nonmetallic raceways to rigid steel conduit or IMC before rising above the floor.
   a. Exception: Raceways from below grade into transformers and switchgear enclosures shall be RNC with bushings.
   b. Exception: Raceways from below grade for telephone boards and data/signal equipment shall be RNC with bushings.
3. Tape conduit from minimum 3 inches below transition to 3 inches above the floor so that no portion of the rigid steel conduit or IMC is in contact with the concrete.

AA. Raceways Through Floors: Install where practical and leave at least 2 inches from any walls. Coordinate with grade or perimeter beams prior to installation.
1. Secure raceways to concrete with conduit clamps.
2. Provide sleeve seals for conduit penetrations through floors. Provide firestopping at all floor penetrations.

BB. Install ALL exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
3. Install conduit as high as possible.
4. Flexible cable or raceway for general circuiting is allowed exposed in mechanical or electrical spaces only. Not allowed in finished spaces.
   a. Exception: As equipment connection only.

CC. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors.

DD. Tighten set screws of threadless fittings with suitable tools.

EE. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

FF. Install pull tape/wires in empty raceways.
1. For raceways under 2 inches and under less than 100 feet, use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
2. Raceways under 2 inches and over 100 feet without intermediate pull boxes, provide mule tape. With intermediate pull boxes use pull wire.
3. For raceways over 2 inches and use mule tape.
4. Sleeves under 36 inches do not require pull tape/wire.

GG. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

HH. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-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. Label boxes “seal-off”. 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.

II. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

JJ. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures if not using MC Cable for lighting whips; for equipment subject to vibration, noise transmission, or movement, and for all motors indoors of non-water operating equipment. Use LFNC in damp or wet locations or to any water operating equipment. Install separate ground conductor across flexible connections.

KK. Prime and Paint exposed conduit in finished spaces, unless pre-painted surface raceways is provided, as per owner/architect. Provide with paintable surface.

LL. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

MM. Floor Boxes:
1. Set floor boxes level. Grout around floor box to fill in area around box opening.
2. Trim after installation to fit flush with finished floor surface.
3. Ground floor box with circuit grounding conductor.
4. Coordinate covers with floor finishes. Provide covers with inserts for tile or carpet.
5. Floor boxes shall be flush with finish floor.

NN. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

OO. Cap all un-used/spare conduits. Does not include sleeves.

3.3 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.
3. Provide cover over conduits during storage to prevent dirt and debris from entering conduits during storage.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

B. Remove debris from conduits prior to capping any spare conduits.

C. Blow-out empty conduits that are future spares in any exterior or underground installation prior to capping.

3.5 RECORD

A. Record the location of all spare conduits buried for future use by the owner.

END OF SECTION

SECTION 26 0553

ELECTRICAL 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. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAYS AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
   1. Color: Black letters on orange field.
   2. Legend: Indicates voltage and service.

B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.

C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

G. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

H. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

I. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.

J. Brass or Aluminum Tags: 2×2×0.05-inch metal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS

A. Safety signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. ¼-inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. ¼-inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.
1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer's written instructions and as follows:
1. Clean surfaces of dust, loose material, and oily films before painting.
2. Prime surfaces using type of primer specified for surface.
3. Apply one intermediate and one finish coat of enamel.

F. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:
1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
3. Apply the following colors to the systems listed below:
    a. Fire Alarm System: Red.
    b. Fire-Suppression Supervisory and Control System: Red and yellow.
    c. Combined Fire Alarm and Security System: Red and blue.
    d. Security System: Blue and yellow.
    e. Mechanical and Electrical Supervisory System: Green and blue.
    f. Telecommunication System: Green and yellow.

G. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

H. Circuit Identification Labels on Boxes: Install labels externally.
1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
2. Concealed Boxes: Plasticized card-stock tags.

3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
4. Normal Power Circuits: Black lettering and numbers
5. Emergency Power Circuits: Red lettering and numbers

I. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

J. Color-Coding of Secondary Branch Circuit Conductors: Use the following colors for service, feeder, and branch-circuit branch circuit conductors:
1. 120/208V 3 Phase Conductors:
    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
    d. Neutral: White.
    e. Ground: Green.
2. 120/240V 3 Phase Conductors:
    a. Phase A: Black.
    b. Phase B: Orange (High Leg Only).
    c. Phase C: Blue.
    d. Neutral: White.
    e. Ground: Green.
3. 120/240V Single Phase Conductors:
    a. Phase A: Black.
    b. Phase B: Red or Blue.
    c. Neutral: White.
    d. Ground: Green.
4. 277/480V 3 Phase Conductors:
    a. Phase A: Purple.
    b. Phase B: Brown.
    c. Phase C: Yellow.
    d. Neutral: Gray.
    e. Ground: Green.
5. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:
    a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches 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. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
    b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

K. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
1. Legend: ¼-inch- steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.

2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

L. Apply identification to conductors as follows:
1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

M. Apply warning, caution, and instruction signs as follows:
1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

N. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with ½-inch- high lettering on 1½-inch-high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Electrical substations.
5. Emergency system boxes and enclosures.
6. Motor-control centers.
7. Disconnect switches.
8. Enclosed circuit breakers.
9. Motor starters.
10. Push-button stations.
11. Power transfer equipment.
12. Contactors.
13. Remote-controlled switches.
14. Dimmers.
15. Control devices.
16. Transformers.
17. Inverters.
18. Rectifiers.
19. Frequency converters.
20. Battery racks.
21. Power-generating units.
22. Telephone switching equipment.
23. Clock/program master equipment.
24. Call system master station.
25. TV/audio-monitoring master station.
26. Fire alarm master station or control panel.

27. Security-monitoring master station or control panel.

END OF SECTION

SECTION 26 0923

LIGHTING CONTROL 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. Section Includes:
1. Time switches.
2. Photoelectric switches.
3. Standalone daylight-harvesting switching controls.
4. Indoor occupancy sensors.
5. Outdoor motion sensors.
6. Lighting contactors.
7. Emergency shunt relays.

B. Related Requirements:
1. Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Specification Compliance Review:
1. Manufacturers and bidders must provide the consulting engineer with a Compliance Review of the Specifications and Addenda's. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications and schedule with the following information; "C", "D", or "E" marked in the margin of the original Specifications and any subsequent Addenda's. If the manufacturer or bidder does not provide the Compliance Review to the engineer for review, with the submittal, the submittal will be subject to rejection as non-compliant.
a. "C" Comply with no exceptions.
b. "D" Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
c. "E" Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives. Non-compliance with the specifications is grounds for rejection as unacceptable. A bid from any alternative or listed equipment manufacturer with any number of exceptions will be reason for rejection for non-compliance without further review.
d. Unless a deviation or exception is specifically noted in the Compliance Review, the manufacturer shall provide full compliance with entire specification. Deviations or exceptions taken in letters or cover letters in a bid document, subsidiary documents, by omission or by contradiction do not release the manufacturer or bidder from being in complete compliance, unless the exception or deviation has

been specifically noted in the Compliance Review and approved by the consulting engineer.

e. Equipment manufacturers or bidders that do not meet the specifications thru the above process will be subject to rejection without further review.

C. Shop Drawings: Contractor to submit entire lighting control system shop drawings showing locations of devices, coverage areas delineated with contour style lines, power pack or controller locations, connections, photocells and locations, and control wiring required.
1. Show installation details for occupancy and light-level sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.
4. Sensors shall overlap in coverage areas requiring multiple sensors.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

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. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Invensys Controls.
4. Leviton Manufacturing Co., Inc.
5. NSi Industries, LLC: TORK Products
6. Lithonia

B. Electronic Time Switches: Solid state, 7-day programmable, with alphanumeric display; complying with UL 917.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 30-A inductive or resistive.
4. Programs: See drawings for number of channels, minimum one channel per circuit plus one spare; each channel is individually programmable with 40 on-off operations per week and an annual holiday schedule that overrides the weekly operation on holidays.
5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
6. Astronomic Time: All channels.
7. Automatic daylight savings time changeover.
8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work includes, but are not limited to, the following:
   1. Cooper Industries, Inc.
   2. Intermatic, Inc.
   3. NSi Industries, LLC; TORK Products.

B. Description: Solid state, with SPST dry contacts rated for 1800 VA to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
   3. Time Delay: Fifteen second minimum, to prevent false operation.
   4. Surge Protection: Metal-oxide varistor.
   5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 DAYLIGHT-HARVESTING SWITCHING CONTROLS

A. Manufacturers: Subject to compliance with requirements. Products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper Industries, Inc.
   2. Eaton Corporation.
   3. Hubbell Building Automation, Inc.
   4. Leviton Manufacturing Co., Inc.
   5. Lithonia Lighting; Acuity Brands Lighting, Inc.
   6. NSi Industries, LLC: TORK Products.
   7. Sensor Switch, Inc.
   8. Tyco Electronics; ALR Brand.
   9. Watt Stopper.

B. Ceiling-Mounted Switching Controls: Solid-state, light-level sensor unit, with separate power pack, to detect changes in indoor lighting levels that are perceived by the eye.

C. Electrical Components, Devices, and Accessories:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
   3. Sensor Output: Contacts rated to operate the associated power pack, complying with UL 773A. Sensor is powered by the power pack.
   4. Power Pack: Dry contacts rated for 20-A load at 120- and 277-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. General Space Sensors Light-Level Monitoring Range: 10 to 200 fc (108 to 2152 lux), with an adjustment for turn-on and turn-off levels within that range.
   6. Atrium Space Sensors Light-Level Monitoring Range: 50 to 500 fc (1080 to 10 800 lux), with an adjustment for turn-on and turn-off levels within that range.
   7. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling.
   8. Set-Point Adjustment: Equip with deadband adjustment of 25, 50, and 75 percent above the "on" set point, or provide with separate adjustable "on" and "off" set points.
   9. Test Mode: User selectable, overriding programmed time delay to allow settings check.

10. Control Load Status: User selectable to confirm that load wiring is correct.
11. Indicator: Two digital displays to indicate the beginning of on-off cycles.

2.4 DAYLIGHT-HARVESTING DIMMING CONTROLS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work includes, but are not limited to, the following:
   1. Cooper Industries, Inc.
   2. Hubbell Building Automation, Inc.
   3. Leviton Mfg. Company, Inc.
   4. Lithonia Lighting; Acuity Lighting Group, Inc.
   5. Watt Stopper.

B. System Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.
   1. Lighting control set point is based on two lighting conditions:
      a. When no daylight is present (target level).
      b. When significant daylight is present.
   2. System programming is done with two hand-held, remote-control tools.
      a. Initial setup tool.
      b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.

C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with separate controller unit, to detect changes in lighting levels that are perceived by the eye.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Sensor Output: 0- to 10-V dc to operate electronic dimming ballasts. Sensor is powered by controller unit.
   3. Power Pack: Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.
   4. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc (120 to 640 lux).

2.5 ROOM CONTROLLER: Manufacturers standard complete assembly in one enclosure rated for location. Unit shall contain controls, connections, relays, and wiring.

A. The following features:
   1. Individual control of each switch leg (zone). See floor plan for number of zones. Provide minimum 1 zones with one spare.
   2. Zone control relay fails closed.
   3. Occupancy sensor input.
   4. Contacts for HVAC (VAV) enable.
   5. Capable of network (Owner) controllable.
   6. Zones capable of either vacancy occupancy operation.

B. Provide factory matched to room controller switching of each zone with either pushbutton backlit touch screen or digital wall switching of each zone. See floor plan for type.

2.6 CEILING MOUNTED OCCUPANCY SENSORS

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. Cooper Industries, Inc.
   2. Hubbell Building Automation, Inc.

3. Leviton Manufacturing Co., Inc.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. Lutron Electronics Co., Inc.
6. NSi Industries LLC; TORK Products.
7. Sensor Switch, Inc.
8. Square D.
9. Watt Stopper.

B. General Requirements for Sensors: Ceiling-mounted, 360 degree, solid-state indoor occupancy sensors with a separate power pack.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Turn lights on or enable wall manual switch when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   4. Power Pack: Dry contacts rated for 20-A load at 120- and 277-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Internal dry contact closure for SPDT.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   7. Bypass Switch: Override the "on" function in case of sensor failure.
   8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.
   9. Dimming output to control 0-10 VDC.
   10. Provides second occupancy time out period enabling lighting to go dim prior to off.
   11. Adjustable maximum minimum.
   12. Can be series or parallel connected.
   13. Photo Cell:
      a. Auto set point
      b. On/Off mode during occupancy
      c. Dimming control

C. Standard Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 15 ft. radius when mounted on a 108-inch high ceiling.

D. Extended Range Dual-Technology Type: Ceiling Mounted
   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq.

cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 28 ft. radius when mounted on a 108-inch high ceiling.

2.7 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

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:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Bryant Electric.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Manufacturing Co., Inc.
5. Lightolier Controls.
6. Lithonia Lighting; Acuity Brands Lighting, Inc.
7. Lutron Electronics Co., Inc.
8. NSi Industries LLC; TORK Products.
9. RAB Lighting.
10. Sensor Switch, Inc.
11. Square D.
12. Watt Stopper.

C. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

D. Wall-Switch Sensor:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft (196 sq. m).
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP. SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Programmable for occupancy or vacancy mode.

2.8 HIGH-BAY OCCUPANCY SENSORS

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:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Hubbell Building Automation, Inc.

C. General Description: Solid-state unit. The unit is designed to operate with the lamp and ballasts indicated.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Turn lights on when coverage area is occupied, and to half-power when unoccupied; with a time delay for turning lights to half-power that is adjustable over a minimum range of 1 to 16 minutes.
   3. Continuous Lamp Monitoring: When lamps are dimmed continuously for 24 hours, automatically turn lamps on to full power for 15 minutes for every 24 hours of continuous dimming.
   4. Operating Ambient Conditions: 32 to 149 deg F (0 to 65 deg C).
   5. Mounting: Threaded pipe.
   6. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   7. Detector Technology: PIR.
   8. Power and dimming control from the lighting fixture ballast that has been modified to include the dimming capacitor and MyzerPORT option.

D. Detector Coverage: User selectable by interchangeable PIR lenses, suitable for mounting heights from 12 to 50 feet (3.7 to 15.2 m).

E. Accessories: Obtain manufacturer's installation and maintenance kit with laser alignment tool for sensor positioning and power port connectors.

2.9 EXTREME-TEMPERATURE OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements. Products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper Industries, Inc.
   2. Sensor Switch, Inc.

B. Description: Ceiling-mounted, solid-state, extreme-temperature occupancy sensors with a separate power pack.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended application in damp locations.
   2. Operation: Turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
   3. Operating Ambient Conditions: From minus 40 to plus 125 deg F (minus 40 to plus 52 deg C).
   4. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   5. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   6. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind cover.
   7. Bypass Switch: Override the "on" function in case of sensor failure.

8. Automatic Light-Level Sensor: Adjustable from 2 to 10 fc (21.5 to 108 lux); keep lighting off when selected lighting level is present.

C. Detector Technology: PIR. Ceiling mounted; detect occupants in coverage area by their heat and movement.
   1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
   2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1500 sq. ft. (139 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
   3. Detection Coverage (High Bay): Detect occupancy within 25 feet (7.6 m) when mounted on a 25-foot- (7.6-m-) high ceiling.

2.10 OUTDOOR MOTION SENSORS

A. Manufacturers: Subject to compliance with requirements. Products that may be incorporated into the Work include, but are not limited to, the following:
   1. Bryant Electric.
   2. Cooper Industries, Inc.
   3. Hubbell Building Automation, Inc.
   4. Leviton Manufacturing Co., Inc.
   5. Lithonia Lighting; Acuity Brands Lighting, Inc.
   6. NSi Industries, LLC: TORK Products.
   7. RAB Lighting.
   8. Sensor Switch, Inc.
   9. Watt Stopper.

B. General Requirements for Sensors: Solid-state outdoor motion sensors.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Dual-technology (PIR and infrared) type, weatherproof. Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm). Comply with UL 773A.
   3. Switch Rating:
      a. Separately Mounted Sensor: Dry contacts rated for 20-A load at 120- and 277-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   4. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off." With bypass switch to override the "on" function in case of sensor failure.
   5. Voltage: Match the circuit voltage.
   6. Detector Coverage:
      a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
      b. Long Range: 180-degree field of view and 110-foot (34-m) detection range.
   7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
   8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
   9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.
   10. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F (minus 40 to plus 54 deg C), rated as "raintight" according to UL 773A.

2.11 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements. Products that may be incorporated into the Work include, but are not limited to, the following:
   1. Allen-Bradley/Rockwell Automation.
   2. ASCO Power Technologies, LP.
   3. Eaton Corporation.
   4. General Electric Company.
   5. Square D.

B. Description: Electrically operated and electrically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
   1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
   2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
   3. Enclosure: Complete sized for contactor poles indicated with continuous hinged cabinet door rated for location (NEMA 1 – indoor, NEMA 3R = exterior). Comply with NEMA 250.
   4. Provide with integral H-O-A switch unless one switch operates multiple contactor cabinets.

C. Interface with DDC System for HVAC: Provide hardware interface to enable the DDC system for HVAC to monitor and control lighting contactors.
   1. Monitoring: On-off status, current sensing.
   2. Control: On-off operation, relay.
   3. See drawings for operation.

2.12 EMERGENCY SHUNT RELAY

A. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
   1. Coil Rating: See drawing detail.

2.13 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section "Conductors and Cables."

B. Classes 2 and 3 Control Cable: Plenum rated, multiconductor cable with stranded-copper conductors.

C. Class 1 Control Cable: Plenum rated, multiconductor cable with stranded-copper conductors.

D. All exterior or underground cabling shall be rated for location.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

C. Provide factory representative to locate and calibrate daylight sensors (both stand-alone and integral to fixture) for daylight harvesting (dimming). Verify operation and document settings.

D. Contractor to verify all sensors intended operation and calibrate sensor field of view and sensitivity.

E. Coordinate with owner for occupancy/vacancy sensor delay times.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

B. Mount cabinet to wall or unistrut frame.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section “Control/Signal Transmission Media.” Minimum conduit size is 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 ROOM CONTROLLER INSTALLATION

A. Room Controller:
   1. Coordinate switch/touch pad location in room.
   2. Locate room controller above ceiling in accessible location.
   3. Provide plenum rated control cable to each device(s).
   4. Provide above ceiling switch.

3.5 IDENTIFICATION

A. Identify components and power and control wiring according to "Electrical Identification."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Verify emergency lighting automatic switchover to generator power at all UL 924 rated light fixture locations.
4. Verification of sensor operation
   a. Sensor turns lighting on/off at programmed times
   b. Sensor automatically dims lighting
   c. Sensor enables additional switching
   d. Sensor works during emergency lighting generator operation with automatic changeover

C. Lighting control devices will be considered defective and replaced with new if they do not pass tests and inspections.

D. Prepare a written report to be sent to the engineer for review indicating the following:
1. Room Number
2. Sensor Type (wall, ceiling, occupancy vacancy, daylighting)
3. Delay time
4. Operation Verification (Yes/No)

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.8 DEMONSTRATION

A. Coordinate demonstration of products with Owner prior to substantial completion.

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

SECTION 26 1310

PULL AND JUNCTION BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work covered by this Section includes furnishing of and paying for all materials, labor, services, equipment, licenses, taxes, other items, and appliances necessary for the execution, installation and completion of all work specified herein and/or shown on the drawings.

B. Pull and junction boxes of appropriate size and depth as indicated on the drawings and as specified hereinafter.

1.2 SUBMITTALS

A. Submittals for products furnished under this section are not required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, ¾-inch flanges, screw covers, etc.

B. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, ¾-inch flanges, bolted covers with full gaskets forming a completely raintight assembly for above ground installations. Provide concrete boxes with screw fittings and drains for in ground pull boxes. Boxes shall be sized as per NEC or as indicated on the drawings.

C. See drawings for pull boxes requiring racks.

D. Boxes with concentric knockouts are not acceptable.

E. Provide ground terminal strip and ground pull box and circuits.

F. As shown on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4 inches square and 2⅛ inches deep. Provide screw covers for junction boxes.

B. Use minimum 16-gauge steel for pull boxes and provide with screw cover.

C. Install boxes in conduit runs wherever necessary to avoid too long runs or too many bends. Do not exceed 100-foot runs without pull boxes.

D. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered adequate support.

E. Install boxes with covers in accessible locations.

F. Observe maximum conductor fill as required by the National Electrical Code.

END OF SECTION

SECTION 26 2416

PANELBOARDS

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 load centers and panel boards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
   1. Lighting and appliance branch-circuit panel boards.
   2. Distribution panel boards.
   3. Transient voltage surge suppressor panel boards.

B. Related Sections include Section “Fuses.”

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter (GFI).

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

F. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of panel board, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Specification Compliance Review:
   1. Manufacturers and bidders must provide the consulting engineer with a Compliance Review of the Specifications and Addenda’s. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications and schedule with the following information; “C”, “D”, or “E” marked in the margin of the original Specifications and any subsequent Addenda’s. If the manufacturer or bidder does not provide the Compliance Review to the engineer for review, with the submittal, the submittal will be subject to rejection as non-compliant.
      a. “C” Comply with no exceptions.

b. "D" Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
c. "E" Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives. Non-compliance with the specifications is grounds for rejection as unacceptable. A bid from any alternative or listed equipment manufacturer with any number of exceptions will be reason for rejection for non-compliance without further review.
d. Unless a deviation or exception is specifically noted in the Compliance Review, the manufacturer shall provide full compliance with entire specification. Deviations or exceptions taken in letters or cover letters in a bid document, subsidiary documents, by omission or by contradiction do not release the manufacturer or bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review and approved by the consulting engineer.
e. Equipment manufacturers or bidders that do not meet the specifications thru the above process will be subject to rejection without further review.

C. Shop Drawings: For each panelboard and related equipment.
1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

D. Field Tests Reports: Submit written test reports and include the following:
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. Panel board Schedules: For installation in panel boards. Submit final versions after load balancing.

F. Maintenance Data: For panel boards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:
1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency that is a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or 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 NEMA PB 1.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of panel boards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

A. Keys: Six (6) spares of each type of panel board cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, the following:
1. Panel boards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
a. Siemens
b. Square D Co.
c. Eaton
2. Electronic Grade Panel boards:
a. Liebert Corporation.
b. Square D Co.
c. Eaton
d. Siemens

2.2 FABRICATION AND FEATURES

A. Enclosures: Flush- and surface-mounted cabinets as indicated on drawings. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

F. Bus: Hard-drawn copper, 98 percent conductivity. Aluminum is **NOT** acceptable.

G. Main and Neutral Lugs:
1. Compression type suitable for use with conductor material on MLO panels.
2. Mechanical type suitable for use with conductor material on MCB panels.

H. Equipment Ground Bus: Copper, Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

I. Service Equipment Label: UL labeled for use as service equipment for panel boards with main service disconnect switches.

J. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

K. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box, where indicated on drawings.

L. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads, where indicated on drawings.

M. Split Bus: Vertical buses divided into individual vertical sections.

N. Skirt for Surface-Mounted Panel boards: Same gage and finish as panel board front with flanges for attachment to panel board, wall, and ceiling or floor.

O. Gutter Barrier: Arrange to isolate individual panel sections.

P. Feed-through Lugs: Compression type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

Q. Provide power meters (peak KW, phase amperage, and kWh) with digital displays in the panels where indicated on the drawings. Provide single enclosure large enough for all panel components. Remote mounted meters are not acceptable. Mount meters in the upper portion of the enclosure. Provide correct trim kit for panel and meter. Meter shall have:
1. Phase Amperage
2. Peak Phase Amperage or KW
3. KWh
4. Phase Voltage
5. Data Output connection to building management system for monitoring
6. Digital Display

2.3 PANEL BOARD SHORT-CIRCUIT RATING

A. UL label indicating series-connected rating with integral or remote upstream devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

B. Fully rated to interrupt symmetrical short-circuit current available at terminals.

C. See panel schedules for minimum rating.

2.4 LOAD CENTERS

A. Overcurrent Protective Devices: Plug-in, full-module circuit breaker.

B. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANEL BOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 DISTRIBUTION PANEL BOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike. Square D I-Line or approved equal.

B. Main Overcurrent Protective Devices: Thermal magnetic circuit breaker.

C. Branch Overcurrent protective devices shall be one of the following:
1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.7 ELECTRONIC GRADE PANEL BOARDS

A. Doors: Front mounted; secured with vault-type latch with tumbler lock; keyed alike. Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

B. Main Overcurrent Devices: Thermal-magnetic circuit breaker.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

D. Bus: Copper phase and neutral buses; 200 percent capacity neutral bus.

E. TVSS Device: IEEE C62.41, integrally mounted, plug-in-style, solid-state, parallel-connected, sine-wave tracking suppression and filtering modules.
1. Minimum single-impulse current rating shall be as follows:
a. Line to Neutral: 100,000 A.
b. Line to Ground: 100,000 A.
c. Neutral to Ground: 50,000 A.
2. Protection modes shall be as follows:
a. Line to neutral.
b. Line to ground.
c. Neutral to ground.

3. EMI/RFI Noise Attenuation Using 50-ohm Insertion Loss Test: 55 dB at 100 kHz.
4. Category C combination wave clamping voltage shall not exceed 600 V, line to neutral and line to ground on 120/208 V systems or 1000 V, line to neutral and line to ground on 277/480 V systems.
5. UL 1449 clamping levels shall not exceed 400 V, line to neutral and line to ground on 120/208 V systems or 800 V, line to neutral and line to ground on 277/480 V systems.
6. Withstand Capabilities: 3000 Category C surges with less than 5 percent change in clamping voltage.
7. Accessories shall include the following:
   a. Form-C contacts, one normally open and one normally closed, for remote monitoring of system operation. Contacts to reverse position on failure of any surge diversion module.
   b. Audible contacts, one normally open and one normally closed, for remote monitoring of system operation. Contacts to reverse position on failure of any surge diversion module.
   c. Six-digit transient-counter set to total transient surges that deviate from the sine-wave envelope by more than 125 V.

2.8 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents. Breakers shall be fully rated for panel AIC rating.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
   1. Lugs: Compression style, suitable for number, size, trip ratings, and material of conductors.
   2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
   3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
   4. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system.
   5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
   6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
   7. Auxiliary Switch: Two SPDT switches with “a” and “b” contacts; “a” contacts mimic circuit-breaker contacts, “b” contacts operate in reverse of circuit-breaker contacts.
   8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
   9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

2.9 CONTROLLERS

A. Motor Controllers: NEMA ICS 2, Class A combination controller equipped for panelboard mounting and including the following accessories:
   1. Individual control-power transformers.
   2. Fuses for control-power transformers.
   3. Bimetallic-element overload relay.
   4. Melting-alloy overload relay.
   5. Indicating lights.
   6. Seal-in contact.
   7. Two convertible auxiliary contacts.
   8. Push buttons.
   9. Selector switches.

B. Contactors: NEMA ICS 2, Class A combination controller equipped for panelboard mounting and including the following accessories:
   1. Individual control-power transformers.
   2. Fuses for control-power transformers.
   3. Indicating lights.
   4. Seal-in contact.
   5. Two convertible auxiliary contacts.
   6. Push buttons.
   7. Selector switches.

C. Controller Disconnect Switches: Fused switch mounted adjacent to and interlocked with controller.
   1. Auxiliary Contacts: Integral with disconnect switches to de-energize external control-power source.

D. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held general-purpose controller.
   1. Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.

2.10 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: To test functions of solid-state trip devices without removal from panel board.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panel boards and accessories according to NEMA PB 1.1 and the NEC.

B. Provide minimum 3-foot clearance in front of panel board.

C. Space panels 4 inches apart and provide spacing for future panels.

D. Locate Surge suppression above and adjacent to panelboard serving. Provide additional spacing between panelboards. Surge suppression to be no greater than 7 feet above finished floor.

E. Locate contactors adjacent to panelboards and provide additional spacing. Small contactor enclosures can be above and to the right or left of the panelboard. Contactor mounting height to be no greater than 7 feet above finished floor.

F. Coordinate with other equipment in the room.

G. Coordinate location of panelboards with transformers and conduit feeders.

H. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated. Mount with at least 6 inches of clearance below panel board.

I. Mounting: Plumb and rigid without distortion of box. Mount recessed panel boards with fronts uniformly flush with wall finish.

J. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panel board loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable. Use manufacturers supplied card and permanent slot location.

K. Install filler plates in unused spaces.

L. Provision for Future Circuits at Flush Panel boards: Stub four 1-inch empty conduits from panel board into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

M. Provision for Future Circuits at Recessed panel boards: Stub four ¾" inch empty conduits from panel board into accessible ceiling space or space designated to be ceiling space in the future. Stub four ¾" inch empty conduits into raised floor space or below slab not on grade.

N. Wiring in Panel board Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

O. Where panelboard meters are indicated, provide power to the meter from the panel being served. Provide CT's in the panel enclosure. Connect CT's to the meter and verify operation of demand and voltage.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Electrical Identification."

B. Panel board Nameplates: Label all panel boards with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws. Provide red nameplates for emergency or stand-by power branch fed panels. Nameplate shall include:
   1. Normal Power
      a. Panel Name
      b. Voltage "277/480", "120/208", or "120/240"
      c. Panel fed from "panel name or transformer name"
   2. Generator Powered Panels
      a. Panel Name
      b. Voltage "277/480", "120/208", or "120/240"
      c. Panel fed from "panel name or transformer name"

d. Non-Hospital
   1) Non-emergency, “Stand-By Branch”
   2) Life Safety Non-Hospital, “Life Safety Branch”
e. Hospital Essential Branches:
   1) “Life Safety”
   2) “Critical Branch”
   3) “Equipment Branch”

3.3 CONNECTIONS

A. Install equipment grounding connections for panel boards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each panel board bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Testing: After installing panel boards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. 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.

C. Balance Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   4. Tolerance: Difference exceeding 20 percent between phase loads, within a panel board, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 ADJUSTING

A. Provide factory technician to set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panel boards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

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 receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

A. GFCI/GFI: Ground-fault circuit interrupter.

B. SPD: Surge protective device.

1.4 SUBMITTALS

A. Product Data: For each product specified.

B. Shop Drawings: Legends for receptacles and switch plates.

C. Samples: For devices and device plates for color selection and evaluation of technical features.

D. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

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.

B. Comply with NEMA WD 1.

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.

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. Deliver extra materials to Owner.
   1. Telephone/Power Service Poles: One for each 10, but not less than one.
   2. Floor Service-Outlet Assemblies: One for each 10, but not less than one.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Wiring Devices:
      a. Bryant Electric, Inc.
      b. Eaton.
      c. Hubbell, Inc.; Wiring Devices Div.
      d. Killark Electric Manufacturing Co.
      e. Leviton Manufacturing Co., Inc.
      f. Pass & Seymour/Legrand; Wiring Devices Div.
   2. Multi-outlet Assemblies:
      a. Airey-Thompson Co.
      b. Wiremold.
   3. Floor Service Outlets and Telephone/Power Poles:
      a. American Electric.
      b. Hubbell, Inc.; Wiring Devices Div.
      c. Pass & Seymour/Legrand; Wiring Devices Div.
      d. Square D Co.
      e. Wiremold.

2.2 RECEPTACLES

A. Straight-Blade and Locking Receptacles: Commercial spec grade Configuration NEMA 5-20R. Color by Architect/Owner.

B. GFCI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2¾-inch-deep outlet box without an adapter. Provide with test light as per NEC.

C. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap.
   1. Devices: Orange in color and listed and labeled as isolated-ground receptacles.
   2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

D. TVSS Receptacles: Duplex type, NEMA WD 6, Configuration 5-20R, with integral TVSS in line to ground, line to neutral, and neutral to ground.

E. USB Receptacles:
   1. USB Charger Tamper-Resistant Receptacle, Two USB Type 2.0 ports 3.5 Amp, 5 Volt DC, 20 Amp, 125 Volt AC Decorator Duplex.
      a. Green LED indicator to show USB power available.
      b. Impact and chemical resistant.

c. Flush fit design.
d. Meets UL94 for 5V flammability rating.
e. Complies with battery charging specification USB BC1.2.
f. Compatible with USB 1.1/2.0/3.0 devices.
g. Listed to UL498 and UL1310.

F. Industrial Heavy-Duty Receptacle: Comply with IEC 309-1.

G. All receptacles on emergency/stand-by power shall be red hospital grade. Faceplate.color by Architect. All emergency/stand-by power receptacles shall have circuit numbers on faceplate. Refer to panel schedules and one-line for emergency/stand-by power branches.

H. Fifteen amp (15A) receptacles are not acceptable and shall not be installed unless specifically directed by the engineer.

2.3 PENDANT CORD/CONNECTOR DEVICES

A. Description: Matching, locking type, plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.
1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector. (Kellum or equal)

2.4 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SWITCHES

A. Snap Switches: Commercial spec grade.

B. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
1. Switch: 20 A, 120/277-V ac.
2. Receptacle: NEMA WD 6, Configuration 5-20R.

C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters rated for amperage and voltage listed.
1. Control: Continuously adjustable slide, and push-button on/off. Single-pole or three-way switch to suit connections.
2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable slide and toggle or rocker; single pole with soft tap or other quiet switch; electromagnetic filter to eliminate noise, RF, and TV interference; and 5-inch wire connecting leads.

2.6 WALL PLATES

A. Single and combination types match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish. Color by Architect.
   2. Material for Finished Spaces:
      a. Smooth, unbreakable nylon; color by Architect.
   3. Material for Kitchens, Unfinished spaces (Mechanical, Electrical), and surface mounted locations: stainless steel.

2.7 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartmentation: Barrier separates power and signal compartments.

C. Housing Material: Die-cast aluminum, satin finished.

D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.

E. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

2.8 MULTI-OUTLET ASSEMBLIES

A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

B. Raceway Material: Metal, with manufacturer's standard finish.

C. Raceway Material: Nonmetal.

D. Wire: No. 12 AWG.

2.9 TELEPHONE/POWER SERVICE POLES

A. Description: Factory-assembled and -wired units to extend power, telephone, and data service from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
   1. Poles: Nominal 2.5-inch-square cross section with height adequate to extend from floor to at least 6 inches above ceiling, and separate channels for power and signal wiring.
   2. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports, and pole foot with carpet pad attachment.
   3. Finishes: One of manufacturers standard finish and trim combinations, including painted and satin anodized-aluminum finishes and wood-grain-type trim.
   4. Wiring: Sized for six No. 12 AWG power and ground conductors; one 75-ohm coaxial telephone/data cable; and four four-pair, 75-ohm telephone/data cable.
   5. Power Receptacles: four single; 20-A; heavy-duty; NEMA WD 6, Configuration 5-20R units.
   6. Signal Outlets: Blank insert with bushed cable opening.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies straight, plumb and secure.

B. Install devices as per ADA height requirements.

C. Review Architectural elevations to coordinate locations and mounting heights. If there are any discrepancies request information prior to install. If height is not listed on the drawings refer to the following:
   1. General purpose receptacles @ 18" AFF.
   2. General purpose receptacles at retirement facilities, nursing homes, hospice, nursing facilities @ 24" AFF.
   3. TV receptacles at the TV mounting location (see architectural elevations) or at 96" AFF.
   4. Above counter receptacles @ 6" above backsplash.
   5. Toilet room receptacles @ 48" AFF.
   6. Equipment receptacles at the piece of equipment. Coordinate with architectural elevations and equipment submittals.
   7. Receptacles shall not be installed flat on any counter surface.

D. Install wall plates when painting is complete. Remove all paint from any wall plates.

E. Provide GFI receptacles within 6 feet of all sinks, exterior receptacles, undercounter equipment, at exterior HVAC equipment, vending machines, and in kitchens.

F. Install wall dimmers to achieve indicated rating after de-rating for ganging as instructed by manufacturer.

G. Do not share neutral conductor on load side of dimmers.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

I. Protect devices and assemblies during painting.

J. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

K. GFCI or GFI receptacles shall be wired to “trip” individually not the entire circuit. Receptacles shall not be daisy chained together from a GFI and create a GFI “protected” receptacle.

3.2 IDENTIFICATION

A. Comply with Section “Electrical Identification.”
   1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
   2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

SECTION 26 2816

DISCONNECT 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 Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes individually mounted switches and circuit breakers used for the following:
   1. Service disconnect switches.
   2. Feeder and equipment disconnect switches.
   3. Feeder branch-circuit protection.
   4. Motor disconnect switches.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section “Wiring Devices” for attachment plugs and receptacles, and snap switches used for disconnect switches.
   2. Section “Switchboards” for individually enclosed, fused power-circuit devices used as feeder disconnect switches.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for disconnect switches, circuit breakers, and accessories specified in this Section.

C. Wiring diagrams detailing wiring for power and control systems and differentiating between manufacturer-installed and field-installed wiring.

D. Field test reports.

E. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.

B. Comply with NFPA 70 for components and installation.

C. Listing and Labeling: Provide disconnect switches and circuit breakers specified in this Section that are listed and labeled.

1. The Terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.

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:
   1. Molded-Case Circuit Breakers:
      a. Siemens Energy & Automation, Inc.
      b. Square D Co.
      c. Eaton
   2. Combination Circuit Breaker and Ground Fault Trip:
      a. Siemens Energy & Automation, Inc.
      b. Square D Co.
      c. Eaton
   3. Molded-Case, Current-Limiting Circuit Breakers:
      a. Siemens Energy & Automation, Inc.
      b. Square D Co.
      c. Eaton
   4. Integrally Fused, Molded-Case Circuit Breakers:
      a. Siemens Energy & Automation, Inc.
      b. Square D Co.
      c. Eaton

2.2 DISCONNECT SWITCHES

A. General: Heavy Duty safety switch, service entrance rated if indicated, with grounding lug kit, rated for equipment amperage, capable to be locked in the open position, with number of poles matching equipment connections.

B. Enclosed, 600V Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle. Switch shall be rated for equipment amperage.

C. Enclosed, 600V Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position. Switch shall be rated for equipment amperage.

D. Enclosure: NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
   1. Outdoor Locations: Type 3R.
   2. Wet or Damp Indoor Locations: Type 4.

2.3 ENCLOSED CIRCUIT BREAKERS

A. Enclosed, Molded-Case Circuit Breaker: NEMA AB 1, with lockable handle.

B. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting rating to meet available fault current. Breakers will be fully rated for panel AIC rating.

C. Application Listing: Appropriate for application, including switching fluorescent lighting loads or heating, air-conditioning, and refrigerating equipment.

D. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.

E. Circuit Breakers, 400 A and Larger: Field-adjustable, short-time and continuous-current settings.

F. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.

G. Current Limiters: Where indicated, integral fuse listed for circuit breaker.

H. Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.

I. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

J. Shunt Trip: Where indicated.

K. Accessories: As indicated.

L. Enclosure: NEMA AB 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
1. Outdoor Locations: Type 3R.
2. Wet or Damp Indoor Locations: Type 4.
3. Hazardous Areas Indicated on Drawings: Type 7C.

M. Transient Voltage Surge Suppressors: IEEE C62.41, to meet requirements for category indicated.
1. Exposure: High.
2. Impulse sparkover voltage coordinated with system circuit voltage.
3. Factory mounted with UL-recognized mounting device.

N. Motor circuit breakers shall be Square D thermal magnetic breakers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches and circuit breakers in locations as indicated, according to manufacturer's written instructions. Provide 2-inch clearance for operation and maintenance.

B. Install disconnect switches and circuit breakers level and plumb.

C. Install wiring between disconnect switches, circuit breakers, control, and indication devices.

D. Provide power to all shunt trip circuit breakers/switches from panel the breakers are mounted in or fed from unless indicated otherwise on drawings. Provide 20A 1P CB and label shunt trip power.

E. Grounding: Ground case and metallic conduit of disconnects.

F. Provide working clearance in front of disconnect switch per NEC, minimum 36 inches.

G. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.
   1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486 A and UL 486 B.

H. Identify each disconnect switch and circuit breaker according to requirements specified in Section "Electrical Identification."

3.2 FIELD QUALITY CONTROL

A. Testing: After installing disconnect switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

C. Infrared Scanning: After Substantial Completion, but not more than two (2) months after Final Acceptance, perform an infrared scan of each disconnect switch and circuit breaker. Remove fronts to make joints and connections accessible to a portable scanner.
   1. Follow-up Infrared Scanning: Perform one (1) additional follow-up infrared scan of each disconnect switch and circuit breaker 11 months after date of Substantial Completion.
   2. Instrument: Use an approved infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide calibration record for device used.
   3. Record of Infrared Scanning: Prepare a certified report identifying disconnect switch and circuit breaker checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

3.3 ADJUSTING

A. Set field-adjustable disconnect switches and circuit-breaker trip ranges as indicated by the Electrical System Coordination Study. Refer to Section – Overcurrent Protection for fault current analysis, coordination study, electrical tests, and device setting requirements.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 4313

SURGE PROTECTIVE DEVICES

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 Surge Protective Devices for low-voltage power, control, and communication equipment.

B. Related Sections include the following:
   1. Section “Wiring Devices” for devices with Surge Protective Devices.
   2. Section “Panelboards” for factory-installed Surge Protective Devices.
   3. Section “Switchboards” for factory-installed Surge Protective Devices.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Product Certificates: Signed by manufacturers of surge protective devices, certifying that products furnished comply with the following testing and labeling requirements:
   1. UL 1283 certification.
   2. UL 1449 Third Edition, or most recent edition, listing and classification.

C. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Failed test results and corrective action taken to achieve requirements.

D. Specification Compliance Review:
   1. Manufacturers and bidders must provide the consulting engineer with a Compliance Review of the Specifications and Addenda’s. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications and schedule with the following information; “C”, “D”, or “E” marked in the margin of the original Specifications and any subsequent Addenda’s. If the manufacturer or bidder does not provide the Compliance Review to the engineer for review, with the submittal, the submittal will be subject to rejection as non-compliant.
      a. “C” Comply with no exceptions.
      b. “D” Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
      c. “E” Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives. Non-compliance with the specifications is grounds for rejection as unacceptable. A bid from any

alternative or listed equipment manufacturer with any number of exceptions will be reason for rejection for non-compliance without further review.

d. Unless a deviation or exception is specifically noted in the Compliance Review, the manufacturer shall provide full compliance with entire specification. Deviations or exceptions taken in letters or cover letters in a bid document, subsidiary documents, by omission or by contradiction do not release the manufacturer or bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review and approved by the consulting engineer.

e. Equipment manufacturers or bidders that do not meet the specifications thru the above process will be subject to rejection without further review.

E. Maintenance Data: For surge protective devices to include in maintenance manuals specified in Division 1.

F. Warranties: Special warranties specified in this Section.

G. All surge suppression device shall be sourced from the same company and current models.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain surge protective devices and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of surge protective device and are based on the specific system indicated. Other manufacturers' products complying with requirements may be considered. Refer to Division 1 Section “Substitutions.”

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. IEEE Compliance: Comply with IEEE C62.41.1-2002, “IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits,” IEEE C62.41.2 - 2002. “IEEE Recommended Practice on Characterization of Surges in Low Voltage AC Power Circuits” and test devices according to IEEE C62.45-2002, “IEEE Recommended Practice on Surge Testing for Equipment connected to Low Voltage AC Power Circuits.

E. NOTE: NEMA LS 1 was rescinded in 2009. Any reference to NEMA LS1 should be removed. We can provide documentation if necessary.

F. UL Compliance: Comply with UL 1283, “Electromagnetic Interference Filters,” and UL 1449 Third Addition, or most recent edition, “Surge Protective Devices.”

1.5 PROJECT CONDITIONS

A. Placing into Service: Do not energize or connect service entrance equipment, panelboards, control terminals, or data terminals to their sources until the installer verifies the service and separately derived system’s Neutral to Ground bonding jumpers per NEC. After the system is energized and stable, connect the surge protective device.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

C. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:
   1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage for 480Y/277V and not less than 125 percent of nominal voltage for 208Y/120V (Verifiable at UL.com).
   2. Operating Temperature: 30 to 120 deg F.
   3. Humidity: 0 to 85 percent, noncondensing.
   4. Altitude: Less than 20,000 feet above sea level.

1.6 COORDINATION

A. Coordinate location of field-mounted surge protective device to allow adequate clearances for maintenance.

1.7 WARRANTY

A. General Warranty: 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.
   1. Provide 5 year manufacturer warranty, 1 year labor install warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Manufacturers of a Broad Line of Surge Protective Devices:
      a. Atlantic Scientific Corp.
      b. Current Technology, Inc.
      c. Cutler-Hammer, Inc.
      d. Hubbell.
      e. Leviton Manufacturing Co., Inc.
      f. Liebert Corp.
      g. Northern Technologies.
      h. Siemens Energy & Automation.
      i. Square D Co.
      j. Tycor International, Inc.
      k. Advanced Protection Technologies, Inc. (APT).
   2. Manufacturers of Category A and Telephone/Data Line Surge Protective Devices:
      a. MCG Electronics, Inc.
      b. NTE Electronics, Inc.
      c. Telebyte Technology, Inc.
      d. Advanced Protection Technologies, Inc. (APT).

2.2 SERVICE ENTRANCE SURGE PROTECTIVE DEVICE

A. Surge Protective Device Description: Non-modular type with the following features and accessories:
   1. Visual LED indicator lights for power and protection status including a minimum of one green LED indicator per phase, and one red service LED.
   2. Audible alarm, with a diagnostic test function and a silencing switch, to indicate when protection has failed.
   3. One set of dry contacts rated at 5 a, 250-V ac, for remote monitoring of protection status.

B. Peak Single-Impulse Surge Current Rating: 200 kA per phase, minimum.

C. Connection Means: Permanently wired.

D. Protection modes and UL 1449 Third Edition, or most recent edition, Voltage Protection Rating (VPR) for grounded wye circuits with voltages of 480Y/277 and 208Y/120; three-phase, four-wire circuits, shall be as follows:
   1. Line to Neutral: 1200 V for 480Y/277 and 700 V for 208Y/120.
   2. Line to Ground: 1200 V for 480Y/277 and 700 V for 208Y/120.
   3. Neutral to Ground: 1200 V for 480Y/277 and 700 V for 208Y/120.

E. SPD shall be UL labeled with 200 kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

F. SPD shall be UL labeled as Type 1 (verifiable at UL.com), intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.

G. SPD shall be UL labeled with 20 kA Inominal (I-n), which is verifiable at UL.com for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

2.3 PANELBOARD SURGE PROTECTIVE DEVICES

A. Surge Protective Device Description: Non-modular type with the following features and accessories:
   1. Visual LED indicator lights for power and protection status including a minimum of one green LED indicator per phase and one red service LED.
   2. Audible alarm, with silencing switch, to indicate when protection has failed.
   3. One set of dry contacts rated at 5 a, 250-V ac, for remote monitoring of protection status.

B. Peak Single-Impulse Surge Current Rating: 100 kA per phase minimum.

C. Protection modes and UL 1449 Third Edition Voltage Protection Rating (VPR) for grounded wye circuits with voltages of 480Y/277 and 208Y/120; three-phase, four-wire circuits, shall be as follows:
   1. Line to Neutral: 1200 V for 480Y/277 and 700 V for 208Y/120.
   2. Line to Ground: 1200 V for 480Y/277 and 700 V for 208Y/120.
   3. Neutral to Ground: 1200 V for 480Y/277 and 700 V for 208Y/120.

D. SPD shall be UL labeled with 200 kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

E. SPD shall be UL labeled as Type 1 (verifiable at UL.com), intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.

F. SPD shall be UL labeled with 20 kA Inominal (I-n), which is verifiable at UL.com, for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

2.4 AUXILIARY PANEL SURGE PROTECTIVE DEVICES

A. Surge Protective Device Description: Unit type, panel-mounted design with the following features and accessories:
   1. Visual LED indicator lights for power and protection status including a minimum of one green LED indicator per phase and one red service LED.
   2. Audible alarm, with silencing switch, to indicate when protection has failed.
   3. One set of dry contacts rated at 5 A, 250-V ac, for remote monitoring of protection status.
   4. Arrangement with wire connections to phase buses, neutral bus, and ground bus.

B. Peak Single-Impulse Surge Current Rating: 100 kA per phase minimum.

C. Protection modes and UL 1449 Third Edition Voltage Protection Rating (VPR) for grounded wye circuits with voltages of 480Y/277 and 208Y/120; three-phase, four-wire circuits, shall be as follows:
   1. Line to Neutral: 1200 V for 480Y/277 and 700 V for 208Y/120.
   2. Line to Ground: 1200 V for 480Y/277 and 700 V for 208Y/120.
   3. Neutral to Ground: 1200 V for 480Y/277 and 700 V for 208Y/120.

D. SPD shall be UL labeled with 200 kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.

E. SPD shall be UL labeled as Type 1 (verifiable at UL.com), intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.

F. SPD shall be UL labeled with 20 kA Inominal (I-n), which is verifiable at UL.com, for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

2.5 SPECIAL SYSTEMS CONTROL AND DATA TERMINALS

A. Protectors for fire alarm, copper control, data, antenna, and telephone conductors entering the building from the outside shall be as recommended by the manufacturer for the type of line being protected.

2.6 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Provide surge suppression for the incoming service at the switchboard or service entrance equipment.

B. Provide surge suppression at the tele/data demark phone board or cabinet as close as possible to the incoming conduit and conductors. Provide surge suppression for all tele/data conductors that are run underground from one MDF/IDF to another.

C. Provide surge suppression at all fire alarm panels that connect to any fire alarm panel or device with underground conductors.

D. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

E. Install devices for panelboard and auxiliary panels with conductors between surge protective device and points of attachment as short (less than 24") and straight as possible. Gently twist conductors together. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

F. Install devices at service entrance on load side with ground lead bonded to service entrance ground. At Service Entrance or Transfer Switch, a UL approved disconnect switch shall be provided as a means of servicing disconnect if a 60 A breaker is not available.

G. Install devices for Distribution, MCC and Branch panelboards with conductors between supressors and points of attachment as short and straight as possible. Do not exceed manufacturer’s recommended lead length. Do not bond neutral to ground.

H. SPD shall have an independent means of servicing disconnect such that the protected panel remains energized. Provide a 30 Amp breaker (or larger sized by manufacturer) to serve this function.

I. Installer may reasonably rearrange breaker locations to ensure short & straightest possible leads to SPDs.

J. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

K. For surface mounted panel boards, associated surge protective device shall be surface mounted adjacent to the panel board with user access. For recessed mounted panel boards, associated surge protective devices shall be mounted recessed adjacent to the panel board with user access. Do not mount above 84 inches unless directed.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:
   1. After installing surge protective devices, test for compliance with requirements.
   2. Complete startup checks according to manufacturer's written instructions.
   3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.19. Certify compliance with test parameters.
   4. If the SPD led are not green, replace with new unit.

B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.

C. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
   1. Verify that electrical wiring installation complies with manufacturer's installation requirements.

END OF SECTION

SECTION 26 5100

INTERIOR LIGHTING

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 interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:
   1. Dimensions of fixtures.
   2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
   3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
   4. Fluorescent and high-intensity-discharge ballasts.
   5. Types of lamps.

B. Specification Compliance Review:
   1. Manufacturers and bidders must provide the consulting engineer with a Compliance Review of the Specifications and Addenda's. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications and schedule with the following information; "C", "D", or "E" marked in the margin of the original Specifications and any subsequent Addenda's. If the manufacturer or bidder does not provide the Compliance Review to the engineer for review, with the submittal, the submittal will be subject to rejection as non-compliant.
      a. "C" Comply with no exceptions.
      b. "D" Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
      c. "E" Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives. Non-compliance with the specifications is grounds for rejection as unacceptable. A bid from any alternative or listed equipment manufacturer with any number of exceptions will be reason for rejection for non-compliance without further review.
      d. Unless a deviation or exception is specifically noted in the Compliance Review, the manufacturer shall provide full compliance with entire specification. Deviations or exceptions taken in letters or cover letters in a bid document, subsidiary documents, by omission or by contradiction do not release the manufacturer or bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review and approved by the consulting engineer.

e. Equipment manufacturers or bidders that do not meet the specifications thru the above process will be subject to rejection without further review.

C. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.
1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.

D. Samples for Verification: For lighting fixtures designated for sample submission in the Interior Lighting Fixture Schedule.
1. Lamps: Specified units installed.
2. Ballast: 120-V model of specified ballast type.
3. Accessories: Cord and plug.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. FM Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM.

D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.6 WARRANTY

A. General Warranty: Special warranty 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. Special Warranties for Fluorescent Ballasts: Written warranty, executed by manufacturer agreeing to replace fluorescent ballasts that fail in materials or workmanship within specified warranty period.
1. Special Warranty Period for Electronic Ballasts: Five years from date of manufacture, but not less than four years from date of Substantial Completion.

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. LED Fixtures: Provide 10 extra 2x4 fixtures in boxes. Deliver to owner.
2. Lamps: Ten (10) for every 100 of each type and rating installed. Furnish at least one (1) of each type.
3. Plastic Diffusers and Lenses: One (1) for every 100 of each type and rating installed. Furnish at least one (1) of each type.
4. Ballasts: One (1) for every 100 of each type and rating installed. Furnish at least one (1) of each type.
5. Globes and Guards: One (1) for every 20 of each type and rating installed. Furnish at least one (1) of each type.
6. Remote Battery Packs: One (1) for every 10, no less than two (2).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers and Models: As indicated on the drawings and lighting fixture schedule. Additional manufacturers may be considered as equal after review from the design engineer. Submit two copies to the design engineer for review prior to bid. Include a cross reference for each fixture submitted. Equipment submitted for “as-equal” without complete cutsheet cross reference, to include drawing fixture lettering, is subject to immediate rejection.
   1. Additional manufacturers will be considered on a case by case basis prior to bid. Post-bid non-approved manufacturers/models are subject to rejection and any cost difference for approved fixtures will be the contractors’ responsibility.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components:
   1. Steel, unless otherwise indicated.
   2. Form and support to prevent warping and sagging.
   3. Housing painted after fabrication.
   4. Smooth hemmed sides and smooth inward formed end flanges.

C. Doors, Frames, and Other Internal Access:
   1. Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.
   2. Standard extruded aluminum door frame has superior structural integrity with premium appearance and mitered corners. Door frame is painted after fabrication, standard. Powder-painted rotary cam latches provide easy, secure door closure. Integral T-bar clips are standard. Acrylic shielding materials is 100% UV stabilized.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.
   4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
2. Lens Thickness: 0.125-inch minimum, unless greater thickness is indicated.

F. Electromagnetic Interference Filters: Integral to fixture assembly. Provide one filter for each ballast where indicated on drawings. Suppress conducted electromagnetic interference filters as required by MIL-STD-461.

G. Housings: Manufacturers standard with integral heat sink.

H. Fixture Type Components:
1. Cylinder: With integral mounting provisions.
2. Downlight:
   a. Universal mounting bracket.
   b. Integral junction box with conduit fittings.
   c. Battery backup test button and integral to fixture.
3. Highbay, Linear
   a. Pendant mounted with secondary support provision.
   b. Universal mounting bracket.
4. Highbay, Nonlinear
   a. Pendant mounted with secondary support provision.
   b. Universal mounting bracket.
   c. Integral junction box with conduit fittings.
5. Linear Industrial
   a. Housing and heat sink rated to the following:
      1) Class 1, Division 2 Groups A, B, C, and D.
      2) NEMA 4X.
      3) IP 54.
      4) IP 66.
      5) Marine and wet locations.
      6) CSA C22.2 No 137.
6. Lowbay
   a. Pendant mounted with secondary support provision.
   b. Universal mounting bracket.
7. Parking Garage (Minimum damp location rated)
   a. Pendant mounted with secondary support provision.
   b. Universal mounting bracket.
   c. Low-profile housing and heat sink.
   d. Fully gasketed and sealed. IP 65 rated.
   e. Stainless-steel latches.
   f. Integral pressure equalizer.
8. Recessed Linear: Integral junction box with conduit fittings.
9. Strip Light
   a. Pendant mounted with secondary support provision.
   b. Universal mounting bracket.
   c. Integral junction box with conduit fittings.
   d. Wire guard or lens.
10. Surface Mount, Linear
    a. Universal mounting bracket.
    b. Integral junction box with conduit fittings.
11. Surface Mount, Nonlinear
    a. Universal mounting bracket.
    b. Integral junction box with conduit fittings.
12. Suspended, Linear
    a. Pendant mounted with secondary support provision.

b. Universal mounting bracket.
c. Provide with aircraft cable.
d. Fixtures shall join with factory fittings of length on drawings with factory ends.
e. Coordinate cord drop.
f. Power feed thru factory quick connect.
g. White cord drop to end of fixture.
h. Minimum two supports per run. Minimum one every 8 feet.

13. Suspended, Nonlinear
    a. Pendant mounted with secondary support provision.
    b. Universal mounting bracket.

2.3 FLUORESCENT LAMP BALLASTS

A. General Requirements: Unless otherwise indicated, features include the following:
   1. Designed for type and quantity of lamps indicated at full light output.
   2. Total Harmonic Distortion Rating: Less than 10 percent.
   3. Sound Rating: A.

B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in “General Requirements” Paragraph above:
   1. Certified Ballast Manufacturer Certification: Indicated by label.
   2. Encapsulation: Without voids in potting compound.
   3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

C. Ballasts for Compact Lamps in Recessed Fixtures: Unless otherwise indicated, additional features include the following:
   1. Type: Electronic, fully encapsulated in potting compound.
   2. Power Factor: 90 percent, minimum.
   3. Operating Frequency: 20 kHz or higher.
   4. Flicker: Less than 5 percent.
   5. Lamp Current Crest Factor: Less than 1.7.
   6. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
   7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

D. Ballasts for Compact Lamps in Nonrecessed Fixtures: Unless otherwise indicated, additional features include the following:
   1. Power Factor: 90 percent, minimum.
   2. Ballast Coil Temperature: 65 deg C, maximum.
   3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
   4. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

E. Ballasts for Low-Temperature Environments: As follows:
   1. Temperatures 0 Deg F and Above: Electronic type rated for 0 deg F starting temperature.

F. Ballasts for Low Electromagnetic Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for consumer equipment.

2.4 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

A. General: Comply with ANSI C82.4. Unless otherwise indicated, features include the following:
   1. Type: Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.
   2. Operating Voltage: Match system voltage.
   3. Minimum Starting Temperature: Minus 22 deg F for single lamp ballasts.
   4. Normal Ambient Operating Temperature: 104 deg F.
   5. Open-circuit operation that will not reduce average life.
   6. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.

B. Encapsulation: Manufacturer's standard epoxy-encapsulated model designed to minimize audible fixture noise.

C. High-Pressure Sodium Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
   1. Instant Restrike Device: Solid-state, potted module, mounted inside high-pressure sodium fixture and compatible with high-pressure sodium lamps, ballasts, and sockets up to 105 W.
      a. Restrike Range: 105- to 130-V ac.
      b. Maximum Voltage: 250-V peak or 150-V ac RMS.

2.5 LED LIGHTING

A. General: Comply with fixture component requirements.

B. All LED products must be UL, ETL and/or CSA listed.

C. All LED products must have LM-79 and LM-80 testing minimum and noted on specification sheet by an independent test lab and in accordance with the following:
   1. Lay-in Troffers: L90 at 60,000 hours at 25 degrees C.
   2. Surface Mounted: L80 at 60,000 hours at 25 degrees C.
   3. Pendant Mount: L90 at 60,000 hours at 25 degrees C.
   4. Recessed Can: L70 at 50,000 hours at 25 degrees C.
   5. High Bay: L70 at 90,000 hours at 25 degrees C. or
   6. L95 at 60,000 hours at 25 degrees C. *
   7. Exterior Surf Mtd: L90 at 100,000 hours at 40 degrees C or
      L80 at 100,000 hours at 25 degrees C *
   8. High Bay and Exterior Fixtures shall be Thermally Protected Drivers

D. All LED products should be identified as L70 and/or L90 ratings based on independent test lab data.

E. Long-life LEDs, coupled with high-efficiency drivers, provide superior level and quality of illumination for extended service life.

F. All outdoor and wet location listed products must clearly state the IP rating carried on the fixture based on independent test lab data.

G. All LED products must be serviceable for accessible for field repair needs. Drivers and internal components are accessible from floor. LED boards include plug-in connectors for

easy replacement or servicing. Suitable for direct insulation contact. Suitable for damp location.

H. Standard embedded controls continuously monitor system performance, allow for constant lumen management/compensation function, facilitate simple “plug-and-play’ network and controls upgrading via Cat-5 cable.

I. Minimum CRI 80.

J. All outdoor lighting color rendering should be within a 7 step McAdams Ellipse. All outdoor lighting should be 4100 kelvin unless specifically noted.

K. All indoor lighting color rendering should be within a 3 step McAdams ellipse. All indoor lighting should be 4000 kelvin unless specifically noted.

L. All LED drivers should be capable of 0-10 volt controls and DMX control and shall dim to 1% of total lumen output. Where specifically specified the dimming driver may be required to dim to .1% of lumen output, otherwise known as “dim to dark”.

M. Driver manufacturers must have a 5 year history producing dimmable electronic LED drivers for the North American market.

N. Ambient driver temperatures must be within -20 degrees to 50 degrees C (-4 degrees to 122 degrees F).

O. Driver must limit inrush current.
1. Base specification: meet or exceed NEMA 410 driver inrush standard of 430 amp per 10 amps load with a maximum of 370 amps/2 seconds
2. Preferred specification : Meet or exceed 30ma’s at 277 VAC for up to 50 watts of load and 75A at 240us att 277 VAC for 100 watts of load
3. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A
4. No visible change in light output with a variation of plus/minus 10percent line voltage input.
5. Total harmonic distortion less than 20%, and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD

P. Any exceptions are at the engineers discretion based on project needs and applicability.

2.6 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:
1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
2. Die cast brushed metal finish exit signage with manufacturer’s multi-style mounting (wall, surface, and top). Plastic exit signage is not acceptable.

B. Internally Lighted Signs: As follows:
1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.
2. All exit signs shall have battery back-up.
3. Provide with self-diagnostics as indicated on the drawings.

2.7 LAMPS

A. Fluorescent Color Temperature and Minimum Color-Rendering Index: 3500 K and 90 CRI, SPX 830, unless otherwise indicated.

B. Noncompact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid-start circuits.

C. Metal-Halide Color Temperature and Minimum Color-Rendering Index: 3600 K and 70 CRI, unless otherwise indicated.

2.8 FIXTURE SUPPORT COMPONENTS

A. Comply with Section “Basic Electrical Materials and Methods,” for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: ½-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, ½-inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.

D. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.9 FINISHES

A. Fixtures: See fixture schedule for colors and finishes. Otherwise manufacturer's standard.
1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures, General: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.
1. Coordinate location of fixtures with architectural ceiling plan.
2. Review architectural elevations prior to rough-in for any wall mounted fixtures. Mount at 84 inches or above, unless otherwise indicated. All wall mounted fixtures shall be ADA compatible if below 84 inches.
3. Center single fixtures in rooms as much as possible.
4. Center fixtures in exposed ceilings. Provide equal distance between fixtures and structural elements (walls, columns, furrdowns, etc.).
5. Provide switching mechanisms for all fixtures whether indicated on the drawings or not.
6. Provide supports without causing deflection of ceiling or wall.
7. Secure to outlet box.

B. Track Lighting

1. Install track parallel with structural or grid. Secure track to structural mounted j-boxes.
2. Conceal transformers above accessible ceiling.
3. Coordinate with architect for track lighting head locations.
4. Aim track heads at objects to be illuminated
5. Adjust pendant track fixtures per architect/owner.

C. Remote Battery or Ballasts:
1. Mount battery backup over accessible ceiling spaces. Provide appropriate battery backup for mounting distance away from fixture.
2. Remote mount ballasts for fixtures in stairwells or over hard ceilings where ballast is not directly accessible from below.
3. Mount all remote ballasts and battery packs together as much as possible over accessible ceiling spaces and mount on unistrut with backboard. **Do not mount directly to wall**. Bundle cabling together and label ballasts/battery packs corresponding to fixture. Provide diagram as required.

D. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for alignment.
1. Install a minimum of four (4) ceiling support system rods or wires attached to the fixture structure on **EACH** fixture secured to the building structure. Locate not more than 6 inches from fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.
3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two (2) ¾-inch metal channels spanning and secured to ceiling tees.

E. Suspended Fixture Support: As follows:
1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging. Provide blocking for heavy fixtures.
2. Stem- Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Coordinate mounting heights with Architect/Engineer. Consult prior to hanging. Stems may need to be field cut.
5. Chain hung fixtures are NOT acceptable unless indicated on the drawings.
6. Provide secondary support for all fixtures without canopy support from structure.
   a. All high and low bay fixtures shall have secondary support cables secured to structure.
7. Sized and rated for fixture weight.
8. Do not use ceiling grid as support for pendant luminaires. Connect support wired or rods to building structure.

F. Flush-Mounted Luminaire Support:
1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

G. Wall-Mounted Luminaire Support:
1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.
3. Provide blocking to support.

3.2 CONNECTIONS

A. Ground equipment:
1. Tighten electrical connectors and terminals according to manufacturers' published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Connect to switch mechanisms (wall switch, contactors, relays) room controllers.

C. Provide dual switching for room mounted dual ballast fixtures. Wire each switch leg to each ballast. Do not connect together unless directed by engineer.
1. Exception: Step dimming fixtures in corridors may be connected together. Consult engineer prior to connections and installing switch legs.

D. Fixture Connections:
1. Indoors
a. With Lay-in ceilings: Provide EMT home runs to structure mounted J-boxes. Provide MC Cable from above ceiling j-boxes to fixtures. Do not daisy chain fixtures together unless specifically indicated on the drawings or allowed by engineer.
b. With gypboard ceilings: Provide EMT home runs to structure mounted J-boxes. Provide access to j-boxes or locate above fixtures. Provide MC Cable from above ceiling j-boxes to fixtures. Do not wire daisy chain fixtures together, unless indicated on the drawings.
c. Exposed (no ceiling) in finished spaces: Conceal EMT as much as possible in adjacent walls. Route EMT to fixtures in exposed spaces with steel compression fittings and install parallel along structural members to structural mounted j-boxes. Conceal conduit along structural members. DO NOT route conduit across open spaces suspended from structural members unless directed by architect or engineer. Mount fixtures from j-boxes. Center fixtures in spaces.
d. Exposed unfinished spaces: Provide EMT runs to structural mounted j-boxes. Route parallel to structural members as much as possible. Mount fixtures or fixture support to j-boxes.
2. Outdoor: Provide IMC for exterior fixtures and connect directly to fixtures or j-boxes as required for fixture mounting. Exterior fixtures mounted in ceilings or structure can use EMT to fixture j-box mounts.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: As follows:
1. Verify normal operation of each fixture after installation.
2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
3. Verify normal transfer to battery source and retransfer to normal.
4. Report results in writing.

E. Malfunctioning Fixtures and Components (Except LED Fixtures): Replace or repair, then retest. Repeat procedure until units operate properly.

F. Malfunctioning LED Fixtures: Replace fixture then retest. LED fixtures shall not be repaired.

G. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

SECTION 26 5600

EXTERIOR LIGHTING

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 exterior lighting units with luminaires, lamps, ballasts, poles/support structures, and accessories.

B. Related Sections include Section “Interior Lighting” for interior fixtures, lamps, ballasts, emergency lighting units, and accessories; and for exterior luminaires normally mounted on buildings.

1.3 DEFINITIONS

A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including pole, post, or other structure, and mounting and support accessories.

B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.

1.4 SUBMITTALS

A. Product Data: For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
   1. Materials and dimensions of luminaires and poles.
   2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
   3. Certified results of laboratory tests for fixtures and lamps for photometric performance.

B. Specification Compliance Review:
   1. Manufacturers and bidders must provide the consulting engineer with a Compliance Review of the Specifications and Addenda’s. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications and schedule with the following information; “C”, “D”, or “E” marked in the margin of the original Specifications and any subsequent Addenda’s. If the manufacturer or bidder does not provide the Compliance Review to the engineer for review, with the submittal, the submittal will be subject to rejection as non-compliant.
      a. “C” Comply with no exceptions.
      b. “D” Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
      c. “E” Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives. Non-compliance with

the specifications is grounds for rejection as unacceptable. A bid from any alternative or listed equipment manufacturer with any number of exceptions will be reason for rejection for non-compliance without further review.

d. Unless a deviation or exception is specifically noted in the Compliance Review, the manufacturer shall provide full compliance with entire specification. Deviations or exceptions taken in letters or cover letters in a bid document, subsidiary documents, by omission or by contradiction do not release the manufacturer or bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review and approved by the consulting engineer.

e. Equipment manufacturers or bidders that do not meet the specifications thru the above process will be subject to rejection without further review.

C. Samples for Verification: For lighting units or luminaires designated for sample submission in the Exterior Lighting Unit Schedule.
1. Lamps: Specified units installed.
2. Ballast: 120-V model of specified ballast type.
3. Finishes: For each finished metal used in support components.

D. Product Certificates: Signed by manufacturers of lighting units certifying that products comply with requirements.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Maintenance Data: For lighting units to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by a testing agency acceptable to authorities having jurisdiction.

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.6 WARRANTY

A. General Warranty: Special warranty 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated on the drawings and fixture schedules.

B. Products: Subject to compliance with requirements, provide products indicated on the drawings. Submit “as equals” to engineer two weeks prior to bid for approval.

2.2 LUMINAIRES

A. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

B. All exterior fixtures shall be wet location rated.

C. Metal Parts: Free from burrs, sharp corners, and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.

I. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

J. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor in luminaire doors.

K. Photoelectric Relays: As follows:
1. Contact Relays: Single throw, arranged to fail in the on position and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay.
2. Relay Mounting: In luminaire housing.

L. LED Wall Luminaires
1. Construction: Two-piece die-cast aluminum housing has integral heat sink fins to optimize thermal management through conductive and convective cooling. The LED driver is mounted to the door to thermally isolate it from the light engines for low operating temperature and long life. Housing is completely sealed against moisture and environmental contaminants (IP65). Housing weep holes for wet location listing in the face-up orientation; permitting safe drainage while maintaining the luminaire’s IP65 rating.
2. Finish: Exterior parts are protected by a zinc-infused Super Durable TGIC thermoset powder coat finish. Minimum 3 mils thickness.

3. Optics: Precision-molded proprietary acrylic lenses with photometric distributions tailored specifically to building mounted applications. Light engines are 4100K (70 min. CRI).
4. Electrical: High-efficacy LEDs mounted to a metal-core circuit board to maximize heat dissipation and promote long life. Class 1 electronic driver has a power factor >90%, THD <20%, and has an expected minimum life of 90,000 hours with <1% failure rate.
5. Hardware: Universal mounting plate with integral mounting support arms.

2.3 LUMINAIRE SUPPORT COMPONENTS

A. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
1. Materials: Will not cause galvanic action at contact points.
2. Mountings: Correctly position luminaire to provide indicated light distribution.
3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized after fabrication unless stainless-steel items are indicated. Provided by the pole manufacturer.

2.4 FINISHES

A. Comply with NAAMM's “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
1. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
2. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.
3. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 606.1 or AAMA 608.1.
a. Color: Light bronze.
b. Color: Medium bronze.
c. Color: Dark bronze.
d. Color: Black.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Luminaire Attachment: Fasten to indicated structural supports.

B. Luminaire Attachment with Adjustable Features or Aiming: Attach luminaires and supports to allow aiming for indicated light distribution.

C. Wall Mounted Fixtures:
1. See architectural elevations.
2. Mount at 84 inches or above, unless otherwise indicated. All wall mounted fixtures shall be ADA compatible if below 84 inches.

3.2 CONNECTIONS

A. Ground equipment.
   1. Tighten electrical connectors and terminals according to manufacturers' published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Ground support structures according to Section "Grounding".
   1. Ground metallic components of lighting units and foundations. Connect luminaires to grounding system with No. 6 AWG conductor.

3.3 CONTROLS VERIFICATION

A. Verify operation of building luminaire controls. Verify photocell operation. Coordinate with owner for the schedule. Program time clock per owner or through software controls.

3.4 FIELD QUALITY CONTROL

A. Inspect each installed unit for damage. Replace damaged units.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source, and as follows:
   1. Measure light intensities at night if specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.
   2. Check intensity and uniformity of illumination.

E. Prepare a written report of tests, inspections, observations and verifications indicating and interpreting results.

F. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.5 CLEANING AND ADJUSTING

A. Clean units after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable luminaires and luminaires with adjustable lamp position to provide required light distributions and intensities.

END OF SECTION

SECTION 27 7450

TELEPHONE AND DATA

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 installation for wiring systems to be used as signal pathways for voice and high-speed data transmission. The wiring, jacks, plates, terminations, and connections are not included in the project.

1.3 RELATED WORK

A. Section “Basic Electrical Methods and Materials.”

B. Section “Raceways and Boxes.”

C. Section “Wiring Devices.”

1.4 DEFINITIONS

A. EMI: Electromagnetic interference.

B. IDC: Insulation displacement connector.

C. LAN: Local area network.

D. PVC: Polyvinyl chloride.

E. STP: Shielded twisted pair.

F. UTP: Unshielded twisted pair.

1.5 SUBMITTALS

A. Shop Drawings: Include dimensioned plan and elevation views of components. Show access and workspace requirements.
   1. System labeling schedules, including electronic copy of labeling schedules, as specified in Part 3, in software and format selected by Owner.

B. Qualification Data: For firms and persons specified in “Quality Assurance” Article. Provide evidence of applicable registration or certification.

1.6 COORDINATION

A. Coordinate Work of this Section with Owner's telephone switch, telephone instrument, workstation, and LAN equipment suppliers. Coordinate service entrance arrangement with local exchange carrier.
   1. Meet jointly with representatives of above organizations and Owner's representatives to exchange information and agree on details of equipment arrangements and installation interfaces.
   2. Record agreements reached in meetings and distribute record to other participants.
   3. Adjust arrangements and locations of distribution frames, patch panels, and cross connects in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

2.2 MOUNTING ELEMENTS

A. Raceways and Boxes: Boxes to be minimum 2½ inches deep, two gang, with plaster ring. Comply with Section "Raceways and Boxes."

B. Backboards: ¾-inch (19-mm) interior-grade, fire-resistive-treated plywood.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cable. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Conceal raceway and wiring except in unfinished spaces.

B. Install exposed raceway parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.

C. Install raceway with wire elbow sweeps suitable for floor installation.

D. Provide raceway from drop locations to cable tray.

E. See floor plans for mounting heights and raceway sizes.

3.3 GROUNDING

A. Comply with Section “Grounding and Bonding.”

B. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Bond shields and drain conductors to ground at only one point in each circuit.

D. Signal Ground Terminal: Locate in each equipment room and wiring closet. Isolate from power system and equipment grounding.

E. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.

F. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each wiring closet and equipment room.

3.4 IDENTIFICATION

A. Identify system components complying with applicable requirements in Section “Electrical Identification” and the following Specifications.

B. System: Owner will provide scheme at coordination meeting.

3.5 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

SECTION 28 3000

FIRE ALARM

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 SCOPE

A. The scope of work is to install a complete operational licensed fully addressable manual fire alarm system with pull stations at all exits, visual devices in all common and multi-use spaces, remote annunciator and main fire control panel.

B. Fire alarm provider shall compute all devices requirements and provide expansion panels as required. Contractor shall coordinate power for any expansion panels with electrical contractor and provide 120V circuits as required. Contractor shall bid a complete and working system. Refer to specifications for devices and locations in addition to the floor plan drawings. The contractor shall be responsible prior to bid for a price for a complete system to include; manual stations, detectors, signal equipment, controls, expansion panels, and devices. The drawings are schematic in nature and include approximate locations of devices. The fire alarm contractor shall coordinate the exact location of the visual signaling device in accordance with the candela of the installed devices.

C. Provide expansion panels or NAC panels to supply additional signal or initiating circuits for a complete system.

D. Daisy chain campus panels together for one complete system. All signals shall be received by the main FACP. All expansion panels shall be compatible with the main FACP. Provide fiber optic cabling between buildings with wire to fiber wire convertors.

E. Provide software programming for individual testing of devices without putting the building in alarm (walk-thru mode) or shutting down the entire system.

1.3 SUMMARY

A. This Section includes fire alarm systems with manual stations, detectors, signal equipment, controls, and devices.

B. Related Sections include the following:
1. Section “Door Hardware” for door closers/holders/smoke detectors, electric door locks, and release devices that interface with fire alarm systems.
2. Section “Control/Signal Transmission Media” for transmission media used for control and signal circuits.

1.4 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.5 SYSTEM DESCRIPTION

A. General: Noncoded, addressable-analog system with manual and automatic alarm initiation; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only. “System shall individually identify each addressable initiating device and other addressable monitor functions. System shall be capable of individually operating each alarm notification appliance and other addressable monitor functions.” Zoning is not acceptable.

B. Provide a fully automatic fire alarm in all building. Fire Alarm system shall be configured such that an alarm condition initiated in one building with activate annunciation devices in all other buildings on the campus. Provide a complete intelligent analog addressable fire alarm system, compliant with the more stringent of local codes having jurisdiction.

C. A full system test/inspection shall be provided by the fire alarm Contractor for a period of one (1) year as a part of the contract.

D. The system shall operate as on integrated protected premise fire alarm control system. Changes in the status of monitored points shall be detected by the microprocessor based fire alarm control panel. Sensor “dirty” and “excessively dirty” trouble conditions shall report automatically. Devices shall be listed by UL for sensitivity testing by means of the portable programmer/tester or by a readout from the control panel. Each addressable device shall be set electronically, devices requiring dipswitch settings, rotary switch settings, staples or jumper settings are not acceptable. Smoke detectors shall alarm at their programmed sensitivity settings and shall not revert to a common default setting when their operating system segment is in the fail safe degrade mode. System shall individually identify each addressable initiating device and other addressable monitor functions. System shall be capable of individual operating each alarm notification appliance and other addressable monitor functions. System shall be capable of individually operating each alarm notification application and other control functions. Life safety alarm function programs shall perform automatically upon system alarm actuation. In addition, control points may be operated manually at any time by the attendant through appropriate keyboard commands. The system FACP shall also provide integral programmable function control switches to allow personal to manually operate specific pre-programmed control output functions.

E. The system as described shall be installed, programmed, tested and delivered to the Owner complete and in fully operational condition. The system shall include all necessary hardware, software, raceways and interconnecting wiring to accomplish the requirements of this specification and the Contract Drawings.

F. Smoke detectors in dwelling areas shall be daisy chained together.

G. Smoke detectors in dwelling are for monitoring only and shall not activate entire building system upon event in dwelling units.

H. Fire alarm system shall have a walk test mode where a device can be tested without disturbing the dwelling area.

I. The system shall be capable to preform in either momentarily audible or silent walk test mode.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show details of graphic annunciator.
1. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
2. Battery: Sizing calculations.
3. Floor Plans: Indicate final outlet locations and routings of raceway connections.
4. Device Address List: Coordinate with final system programming.
5. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

C. Coordination Drawings: Plans, sections, and elevations drawn to scale and coordinating installation of smoke detectors, control modules, and relays in ducts and access to them. Show the following near each duct smoke provision of detector installation:
1. Size and location of ducts, including lining.
2. Size and location of piping.
3. Size and arrangement of structural elements.
4. Size and location of duct smoke detector, including air-sampling elements.

D. Operating Instructions: For mounting at the FACP.

E. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.

F. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.

H. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.

I. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Section “Submittals,” make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

J. Certificate of Completion: Comply with NFPA 72, AHJ, and local amendments.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.

D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.

E. Comply with NFPA 72.

1.8 SEQUENCING AND SCHEDULING

A. Existing Fire Alarm Equipment: Maintain fully operational until new equipment has been tested and accepted. As new equipment is installed, label it “NOT IN SERVICE” until it is accepted. Remove labels from new equipment when put into service and label existing fire alarm equipment “NOT IN SERVICE” until removed from the building.

B. Equipment Removal: After acceptance of the new fire alarm system, remove existing disconnected fire alarm equipment and restore damaged surfaces.
   1. Package operational fire alarm and detection equipment that has been removed and deliver to Owner.
   2. Remove from site and legally dispose of existing material not designated for other disposition.

1.9 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. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than one unit.
   2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than one unit.
   3. Smoke Detectors, Fire Detectors, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than one unit of each type.
   4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than one unit of each type.
   5. Keys and Tools: One extra set for access to locked and tamper proofed components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cerberus Pyrotronics.
   2. Edwards Systems Technology; Unit of General Signal.
   3. Firetrol.
   4. Fire Lite Alarms, Inc.
   5. Gamewell Co. (The).
   6. Notifier; Div. of Pittway Corp.
   7. Silent Knight.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Control of System: By the FACP.

B. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

C. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.

D. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.

E. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines.

F. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when an open circuit, ground or wire-to-wire short occurs, or an open circuit and a ground occur at the same time in an initiating device circuit, signal line circuit, or notification-appliance circuit.

G. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.

H. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a smoke or flame or heat detector, or operation of a sprinkler flow device initiates the following:
   1. Notification-appliance operation.
   2. Identification at the FACP and the remote annunciator of the device originating the alarm.
   3. Transmission of an alarm signal to the remote alarm receiving station.
   4. Unlocking of electric door locks in designated egress paths.
   5. Recall of elevators.
   6. Shutdown of fans and other air-handling equipment serving zone when alarm was initiated.
   7. Recording of the event in the system memory.

I. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP and the remote annunciator.
   1. Silencing-switch operation halts alarm operation of notification appliances and activates an “alarm silence” light. Display of identity of the device is retained.
   2. Subsequent alarm signals from other devices reactivate notification appliances until silencing switch is operated again.
   3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

J. Operating a heat detector in the elevator shaft shuts down elevator power by operating a shunt trip in a circuit breaker feeding the elevator.

K. Smoke detection with alarm verification initiates the following:

1. Audible and visible indication of an “alarm verification” signal at the FACP.
2. Activation of a listed and approved “alarm verification” sequence at the FACP and the detector.
3. General alarm if the alarm is verified.
4. Cancellation of the FACP indication and system reset if the alarm is not verified.

L. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system initiates the following:
1. A supervisory, audible, and visible “sprinkler trouble” signal indication at the FACP and the annunciator.
2. Flashing of the device location-indicating light for the device that has operated.
3. Transmission of trouble signal to remote central station.

M. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP causes the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. Same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors. Sensitivity adjustments and sensitivity-adjustment schedule changes are recorded in system memory.

N. Removal of an alarm-initiating device or a notification appliance initiates the following:
1. A “trouble” signal indication at the FACP and the annunciator for the device or zone involved.
2. Transmission of trouble signal to remote alarm receiving station.

O. FACP Alphanumeric Display: Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.

2.3 MANUAL PULL STATIONS

A. Description: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color.
1. Single-action mechanism initiates an alarm.
2. Double-action mechanism requires two actions, such as a push and a pull, to initiate an alarm.
3. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.
4. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false alarm operation.
5. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.
6. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
7. Outdoor device to be complete with weatherproof outlet box, mounting plate, mounting hardware, and terminal strip for wiring connections.

2.4 SMOKE DETECTORS

A. General: Include the following features:
1. Operating Voltage: 24V powered from the fire alarm control panel.

2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
3. Plug-in Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.
4. Integral Visual-Indicating Light: LED type. Indicates detector has operated.
5. Sensitivity: Can be tested and adjusted in-place after installation.
6. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
7. Remote Controllability: Unless otherwise indicated, detectors are analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

B. Smoke detectors shall be photoelectric type.
1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.
3. Integral Thermal Detector: Fixed-temperature type with 135 deg F setting.

C. Duct Smoke Detector: Photoelectric Type.
1. Sampling Tube: Design and dimensions as recommended by the manufacturer for the specific duct size, air velocity, and installation conditions where applied. Detectors shall be capable of self-sensitivity testing and report back to the fire alarm panel. All detectors shall be addressable and resettable from FACP.
2. Provide necessary relays and control module to interface with the fire alarm for damper closure and AHU shutdown.
3. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.
4. Unit shall have local reset.
5. Provide remote test station and status indicator for duct smoke detectors above hard ceilings or mounted higher than 12 feet AFF.
6. Unit shall be 24V powered from the Fire Alarm Control Panel.
7. Each smoke sensor and its duct housing shall be self-compensating for the effects of air velocity (from 300 to 4000 FPM), temperature, humidity and atmospheric pressure. It shall not be necessary to field adjust the sensitivity to compensate for the above effects.

D. Combination Smoke and CO detectors: Addressable detector for smoke detection and CO detection in the same device.
1. Sensor: Four sensing elements for detection and false signal rejection.
2. Separate CO Signal.
3. Intelligent Sounder Base
4. Sync with other devices
5. Ceiling or wall mounted

E. Smoke detectors in sleeping areas.
1. Sensor: Two sensing elements for detection and false signal rejection.
2. Intelligent Sounder Base
3. Sync with other devices
4. Ceiling or wall mounted

2.5 OTHER DETECTORS

A. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or rate of rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.

1. Mounting: Adapter plate for outlet box mounting.
2. Mounting: Plug-in base, interchangeable with smoke detector bases.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Unit shall be 24V powered from the fire alarm control panel.

B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
1. Mounting: Adapter plate for outlet box mounting.
2. Mounting: Plug-in base, interchangeable with smoke detector bases.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Unit shall be 24V powered from the fire alarm control panel.

2.6 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and have screw terminals for system connections.
1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
2. Devices shall be red in color.
3. All exterior fire alarm devices shall be weatherproof.

B. Audio Alarm Devices (Horns – Interior Installation):
1. Electronic-vibrating-polarized type, 24V dc; with provision for housing the operating mechanism behind a grille. Horns produce a minimum sound pressure level of 85 dB, measured 10 feet from the horn.
2. Device to be complete with outlet box, mounting plate, mounting hardware, and terminal strip for wiring connections.

C. Audio Alarm Devices (Horns – Mini Horns):
1. Electronic-vibrating-polarized type, 24V dc, “mini horn”, with provision for housing the operating mechanism behind a grille. Horns produce a minimum sound pressure level of 85 dB, measured 10 feet from the horn.
2. Device to be complete with outlet box, mounting plate, mounting hardware, and terminal strip for wiring connections.

D. Audio Alarm Devices (Horns – Exterior Installation):
1. Electronic--vibrating-polarized type, 24V dc; with provision for housing the operating mechanism behind a grille. Horns produce a minimum sound pressure level of 85 dB, measured 10 feet from the horn.
2. Grille and device to be of weatherproof design and construction.
3. Device to be complete with outlet box, mounting plate, mounting hardware, and terminal strip for wiring connections.

E. Visual Alarm Devices (Strobe Lights): Xenon strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. The word “FIRE” is engraved shall be engraved on the device.
1. Rated Light Output: 75 candela (minimum), 110 candela in larger coverage spaces.
2. Strobe Leads: Factory connected to screw terminals.

F. Audio/Visual Alarm Devices (Horn and Strobe Light): Combination audio and visual alarm devices consisting of the same devices indicated above for “Audio Alarm Devices (Horns)” and “Visual Alarm Devices (Strobe Lights)” provided as a single combination alarm device.

G. Voice/Tone Speakers:
1. High-Range Units: Rated 2 to 5 W.
2. Low-Range Units: Rated 1 to 2 W.
3. Mounting: Flush, semi-recessed, surface, or surface-mounted; bidirectional as indicated.
4. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.

H. Audio Visual Devices (Voice/Tone Speakers and Strobe Lights): Combination voice/tone speakers and visual alarm devices consisting of the same devices indicated above for "Voice/Tone Speakers" and "Visual Alarm Devices (Strobe Lights)" provided as a single combination alarm device.

2.7 REMOTE DEVICE LOCATION-INDICATING LIGHTS AND IDENTIFICATION PLATES

A. Description: LED indicating light near each smoke detector that may not be readily visible, and each sprinkler water-flow switch and valve-tamper switch. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.8 REMOTE CONTROL RELAYS

A. Remote control relays for shutdown air handling units and operation of electrically controlled circuits from the fire alarm system shall be provided.

B. Provide relays for Fire Shutters, magnetic Locks, Door Holds and all other egress powered circuits.

C. Relays shall be UL listed, SPDT, DPDT, operating coil voltage appropriate for the fire alarm system and terminal strips for connection of input and output wiring.

D. Relays shall contain a red LED to indicate when the relay coil is energized.

E. These relays shall be employed where local contacts are required for system status, remote control of electrical loads, shutdown of air handling equipment, actuation of other systems or equipment (elevator controls, etc.), and any other general uses.

F. Device to be complete with outlet box, mounting plate, mounting hardware, and terminal strip for wiring connections.

2.9 CENTRAL FACP

A. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure. Provide 25% future expansion capacity.
1. Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1-inch high. Identify individual components and modules within cabinets with permanent labels.
2. Mounting: Surface.

B. Alarm and Supervisory Systems: Separate and independent in the FACP. Alarm-initiating zone boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.

C. Control Modules: Include types and capacities required to perform all functions of fire alarm systems.

D. Indications: Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.

E. Indicating Lights and System Controls: Individual LED devices identify zones transmitting signals. Lights distinguish between alarm and trouble signals, and indicate the type of device originating the signal. Manual switches and push-to-test buttons do not require a key to operate. Controls include the following:
1. Alarm acknowledge switch.
2. Alarm silence switch.
3. System reset switch.
4. LED test switch.

F. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.

G. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components, including annunciation, supervision, and control.
1. Display: A minimum of 80 characters; alarm, supervisory, and component status messages; and indicate control commands to be entered into the system for control of smoke detector sensitivity and other parameters.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

H. Voice Alarm: An emergency communication system includes central voice alarm system components complete with microphones, preamplifiers, amplifiers, and tone generators. Features include the following:
1. Two alarm channels permit simultaneous transmission of different announcements to different zones or floors automatically or by using the central control microphone. All announcements are made over dedicated, supervised communication lines.
2. Status annunciator indicates the status of various voice alarm speaker zones and the status of firefighters' two-way telephone communication zones.

I. Instructions: Printed or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.10 FIRE ALARM EXPANSION PANEL

A. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure.
1. Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1 inch high. Identify individual components and modules within cabinets with permanent labels.

2. Mounting: Surface.

B. Alarm and Supervisory Systems: Alarm-initiating boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.

C. Control Modules: Include types and capacities required to perform all functions of fire alarm systems.

D. Indications: Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.

E. Indicating Lights and System Controls: LCD display mimics FACP signals. Manual switches and push-to-test buttons do not require a key to operate. Controls include the following:
1. Alarm acknowledge switch.
2. Alarm silence switch.
3. System reset switch.
4. LED test switch.

F. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.

G. Instructions: Printed or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

H. Expansion panels shall be daisy chained with the main fire alarm control panel to operate as one complete system.

2.11 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, reset, and test.
1. Mounting: Flush cabinet, NEMA 250, Class 1.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

2.12 EMERGENCY POWER SUPPLY

A. General: Components include sealed maintenance free battery, charger, and an automatic transfer switch.
1. Battery Nominal Life Expectancy: 20 years, minimum.

B. Battery Capacity: Comply with NFPA 72.
1. Magnetic door holders are not served by emergency power. Magnetic door holders are released when normal power fails.

C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If

batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.

D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

2.13 AUXILLARY POWER MODULE (NAC)

A. Description: Intelligent power supply module with built in synchronization, AC power connection, battery charging circuit, and backup battery for 24 hours operation for all powered circuits. Programmable for auxiliary power, constant, resettable, or door holder operation
   1. Minimum 6 Amp notification power expander with switching mode
   2. Ground fault detector
   3. Notification/Aux Power Circuits: 2 Class A, 4 Class B
   4. Power input 120V

B. Communicates with main FACP SBUS with standard manufacturers 4 wire cabling up to 4000 feet.

C. AC loss of power delay option for shutting off power to door holders. (provide only on NAC panels with door holders on the fire alarm system)

D. Transmits all signals to the FACP

2.14 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module listed for use in providing a multiplex system address for listed fire and sprinkler alarm-initiating devices with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to the elevator controller to initiate elevator recall or to a circuit-breaker shunt trip for power shutdown.

2.15 WIRE TO FIBER CONVERTOR

A. Description: Fiber optic cabling to SBUS convertor on a single card mounted in the FA panel or in a remote enclosure and connected to the fire alarm panel.
   1. Range: Up to one mile
   2. Transfers all signals between panels
   3. Does not require TVSS or grounding
   4. Duplex connectors for the transmittance and receiving of signals
   5. Compatible with the FA system from the same manufacturer
   6. Powered from the FA panel locally 9-35 VDC

2.16 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled under UL 864 and NFPA 72.

B. Functional Performance: The FACP shall have a digital alarm communicator transmitter (DACT) module to transmit alarm signals to a Remote Central Monitoring station. The DACT shall support dual telephone lines. Unit receives an alarm, supervisory, or trouble signal from the FACP panel, and automatically captures one or two telephone lines and dials a preset

number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising two lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on either telephone lines, the local trouble signal is initiated.

C. The fire alarm system shall provide point identification reporting of alarm, trouble and supervisory conditions to the monitoring station. Group reporting will not be accepted.

D. The communicator shall automatically send restore signals to the central station when alarm, trouble or supervisory is cleared. Required on-premise restore is not acceptable.

E. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.17 GUARDS FOR PHYSICAL PROTECTION

A. Description: Size and shape for the manual station, smoke detector, gong, or other device requiring protection.
1. Factory fabricated and furnished by the manufacturer of the device.
2. Finish: Paint of color to match the protected device.
3. Manual Pull Station – Clear Lexan.
4. Smoke/Heat Detector – Wire Mesh.
5. Gong – Wire Mesh.

2.18 WIRE

A. Non-Power-Limited Circuits: Red jacketed plenum rated solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

B. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Connect the FACP with a disconnect switch with lockable handle or cover. Install smoke detectors above the FACP, all expansion panels, and all power supplies.

B. Connect devices to FACP, expansion panel, or NAC up to 300 feet from panel. Beyond 300 feet provide additional NAC panels.

C. Mount wire to fiber convertors in either the fire alarm panel with stand-offs or in remote cabinet adjacent to fire alarm panel. Provide conduit between remote cabinet and FA panel.

D. Manual Pull Stations: Mount semi-flush in recessed back boxes.

E. Ceiling-Mounted Smoke Detectors: Not less than 4 inches from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet apart in any direction.

F. Wall-Mounted Smoke Detectors: At least 4 inches, but not more than 12 inches, below the ceiling.

G. Smoke Detectors near Air Registers: Install no closer than 60 inches.

H. Duct Smoke Detectors: Comply with manufacturer's written instructions.
   1. Verify that each unit is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   2. Install sampling tubes so they extend the full width of the duct.
   3. Install necessary relays and control modules to accomplish mechanical equipment operation upon detector activation.

I. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

J. Audible Alarm-Indicating Devices: Install so the top of the device is no less than 90 inches above finish floor and not less than 6 inches below the ceiling. Do not install higher than 120 inches unless directed. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

K. Visible Alarm-Indicating Devices: Install so the top of the device is no less than 90 inches above finish floor and not less than 6 inches below the ceiling. Do not install higher than 120 inches unless directed.

L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

M. FACP: Surface mount with tops of cabinets not more than 72 inches above the finished floor.

N. Annunciator: Install with the top of the panel not more than 72 inches above the finished floor.

O. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that will resist 100-mph wind load with a 1.3 gust factor without damage.

P. Auxiliary Power Module (NAC): Locate in accessible areas where batteries and associated equipment may be readily maintained. Provide 120-volt/1-phase power from a dedicated 120-volt 1-phase 20-amp circuit for alarm indicating devices.

Q. All exterior fire alarm devices shall be weatherproof.

3.2 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to specification section “Raceways and Boxes.” Conceal raceway and coordinate with structural for conduit routes.
   1. Exceptions:
      a. All wiring in mechanical/electrical/equipment rooms shall be in conduit.
      b. All wiring 9’ AFF and below or below ceilings shall be in conduit.

B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Wiring between panels or NAC panels:
   1. Within the building and conditioned spaces: Provide manufacturers plenum rated cabling between expansion panels and NAC panels within the building in conduit as per raceway and boxes schedule or as per the wiring installation method in this specification section. If the distance exceeds manufacturers copper cabling, provide plenum rated fiber optic cabling with a wire to fiber convertor.
   2. Outside the building or not within the conditioned space: Provide exterior rated plenum fiber optic cabling in conduit as per raceway and boxes schedule or as per the wiring installation method in this specification section. Provide a wire to fiber convertor either in the panel or in a remote mounting cabinet installed adjacent to the FA panel.
   3. Fiber Install:
      a. Fiber runs shall use long sweep elbows and be protected from damage.
      b. Provide manufacturer required number of strands. Polish and terminate fiber in connectors per wire to fiber convertor. Connect to the wire to fiber convertor and test for operation.
      c. Provide single or multi-mode; 50 or 62.5 micron fiber optic cabling per manufacturer convertor.

D. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Red fire alarm plenum rated conductors. Paint fire alarm system junction boxes and covers red.

F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors.

G. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

H. Provide TVSS and grounding for all devices connected to a FA or NAC panel, external to the building conditioned space.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to specification section Electrical Identification.

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply disconnect switch red and label FIRE ALARM.

3.4 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Section “Grounding and Bonding.”

D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

E. Ground radio alarm transmitter system and equipment as recommended by the manufacturer. Provide grounding for antenna to building ground.

3.5 APPLICATION SCHEDULE

A. General Application: Provide fire alarm devices where indicated on drawings or as scheduled below. Locations on drawings are approximate. Contractor shall coordinate exact locations with architectural drawings. Contractor shall submit locations of fire alarm devices to engineer/architect as part of fire alarm shop drawings. Locations shall be based upon ability to mount the device to building construction and coverage afforded the device.

B. Fire Alarm Panel: Panel shall be mounted in a continuously (during normal hours) occupied space. Provide dedicated smoke detector for fire alarm panel.

C. Fire Alarm Expansion Panel: Provide fire alarm expansion panel for either every 35 devices or to maintain no more than 15% voltage drop to the device. Provide dedicated smoke detector connected to fire alarm for fire alarm expansion panel.

D. Remote Annunciator: Provide remote annunciator at building address entrance. Location as shown on drawings is approximate and shall be coordinated with architectural.

E. Pull Station: Provide pull stations within 5 feet of all exits to building and second floor stairwell access.

F. Audio/Visuals and Visuals: Device locations indicated on the drawings are approximate. Coordinate with architectural for exact locations and install as per coverage criteria. Install devices in areas that are unobtrusive to room or space intent (e.g. do not install device at the back of the stage, but install stage device off to one side; or do not try to install device on glass block wall).

G. Control Modules and Relays:
   1. Provide control modules and relays at all smoke fire dampers, air handler duct smoke detectors, and equipment smoke detectors for shutdown.
   2. Fire alarm activated fire suppression equipment.
   3. Provide control module and relay for elevator recall for designated floor, alternate floor, and shunt trip.

H. Monitor Modules:
1. Provide monitor modules for all devices to be monitored by the fire alarm system but not controlled.
2. Provide monitor modules for all flow and tamper switches.
3. Provide monitor modules for all dry pipe pressure switches.
4. Provide fire control monitor module for Halon/FM-200 or similar systems that are locally activated.

I. Master/Slave Synchronization: Provide master synchronization module at fire alarm panel and slaves for every two (2) circuits. Provide notification at fire alarm panel for synchronization and low power or A/C loss.

J. Duct Smoke Detectors: Provide as shown on the drawings and as indicated below (applications may be redundant with drawings).
1. Duct smoke detectors shall be provided within five feet, with no breaks in the ductwork, of all smoke fire dampers in the direction of airflow. Mount the duct smoke detectors to provide unrestricted access to the control section and for full removal of the sampling tubes.
2. Duct smoke detectors shall be provided at the discharge to all air handling units and mounted in accordance with NFPA 72.

K. Weatherproof Horn/Strobe: Provide weatherproof horn/strobe for all interior courtyards.

L. Weatherproof Horn: Provide weatherproof horns to be mounted high on exterior wall (coordinate with architectural), audible from any entrance to the building.

M. Detectors in sleeping Areas: Provide with integral sounder bases. Detectors shall have local sounder bases which activate in alarm and provide signal to the FACP.

N. Detectors in sleeping Areas with Gas Heat: Provide combination smoke and CO detection with integral sounder bases which activate in alarm and provide signal to the FACP.

3.6 MECHANICAL COORDINATION

A. See mechanical duct accessory specification for smoke fire dampers and mechanical drawings for sequences of operation. Provide control circuits, relays, monitor modules as required. Fire alarm system shall be capable of shutting down all dampers and air handlers during a fire alarm activation. Coordinate for sequencing as per duct accessories specification, mechanical specifications, and mechanical sequence of operation.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.

B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.

D. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:
1. Verify the absence of unwanted voltages between circuit conductors and ground.
2. Test all conductors for short circuits using an insulation-testing device.
3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, quality, freedom from noise and distortion, and proper volume level.
8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

3.8 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 8 hours' training.

2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

3.10 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested visits to Project site for this purpose.

END OF SECTION

SECTION 31 2333
EXCAVATION, TRENCHING, AND BACKFILLING

PART 1 GENERAL

1.01 DESCRIPTION

A. The work to be performed under this Specification shall consist of furnishing all labor, equipment and materials and performing all operations in connection with the excavating, trenching, and backfilling for pipelines as shown on the plans and as specified herein.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials for pipe embedment will meet TCEQ Regulations for depth of bury and class of pipe and any embedment details as shown on the Plans.

B. Concrete (For encasement or blocking)
See SECTION 03 3000 - CAST-IN-PLACE CONCRETE. Material shall conform to ASTM C94. The compressive strength of the concrete shall be at least 2,000 psi and shall contain at least four (4) sacks of cement per cubic yard.

C. Cement stabilized sand.

2.02 TESTING REQUIREMENTS

A. Compaction tests for all backfill may be required for every 200 linear feet of trench and for each twelve-inches (12") vertically. Density tests, shall be measured as one unit for each test. The Owner shall pay for Geotechnical tests ordered that meet the requirements of the plans and specifications. Failed tests shall be charged to the Contractor. Refer to City Standard Trench Detail for compaction effort requirements.

PART 3 EXECUTION

3.01 CONSTRUCTION METHODS

A. Control of Water
Provide sufficient pumping equipment, in good working order, available at all times to remove any water that accumulates in excavations. When the excavation crosses a drainage pathway, the contractor shall provide for means of alternate drainage. The discharge of dewatering equipment shall not cause damage to private or public property.

B. Sheeting, Shoring, and Bracing
See SECTION 31 5000 – TRENCH SAFETY.
In caving ground, or in wet, saturated, or flowing materials, the contractor shall sheet, shore, or brace the sides of the trench so as to maintain the excavation properly in place. When excavations are made adjacent to existing building or other structures or in paved streets, particular care must be taken to adequately sheet, shore, and brace the sides of the excavation to prevent undermining of, or settlement beneath, the structures or pavement. Underpinning of adjacent structures or pavement shall be done by the Contractor at his own cost and expense, in a manner satisfactory to the Engineer and when required by the Engineer. The pavement shall be removed, the void satisfactorily refilled and compacted, and the pavement replaced by the Contractor. The entire expense of such removal and subsequent replacement thereof shall be borne by the Contractor. Sheeting, shoring, and bracing shall not be left in place, unless otherwise provided for in the contract or authorized by the Engineer. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structure, private or public properties, and so as to avoid cave-ins or sliding of the banks. All holes or voids left by the removal of the sheeting, shoring, or bracing shall be immediately and completely filled and compacted with suitable materials.

C. Guarantee
1. Guarantee the backfilling of excavation and trenches against settlement for a period of one (1) year after the final completion of the contract under which the work is performed.

2. Make all repairs or replacements made necessary by settlement, including refilling, compacting, and reseeding or resodding the upper portion of the ditch and repairing broken or settled pavements, driveways, and sidewalks within five (5) days after notice from the Engineer.

D. Preparation

1. Site Preparation: Prepare the construction site for construction operations by removing and disposing of all obstructions and objectionable materials in accordance with contract documents.
2. Alignment, Grade, and Minimum Cover
   a. The water and sewer mains shall be laid and maintained to lines and grades established by the plans and specifications with fittings, valves, hydrants, manholes and clean-outs at the required locations, unless otherwise pre-approved by the Engineer. Valve-operating stems shall be oriented in a manner to allow proper operation. Hydrants shall be installed plumb.
   b. Cut sheets shall be provided to the City's Inspector. The contractor shall determine the alignment and grade or elevation of the pipeline from offset stakes. Offset stakes shall be placed every 100 feet. The contractor shall also provide a continuous chalk line along the alignment of the trench for use by the operator of the excavating equipment. The contractor shall provide a laser beam and grade pole to assist in grading the ditch to the proper elevation.
   c. Should the ditch be graded below the required elevation, bring subgrade to the required elevation with cement stabilized sand or rounded pea gravel. The use of excavating materials for this application will not be allowed.
   d. Where pipe grades or elevations are not definitely fixed by contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the pipe. Greater pipe cover depths may be necessary for clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevations.
3. Prior Investigation: Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care should be exercised by the Contractor during excavation avoid damage to existing structures.
4. Unforeseen Obstructions: When obstructions that are not shown on the plans are encountered during the progress of work and interfere so that an alteration of the plans is required, the Engineer will alter the plans or order a deviation in line and grade or arrange for removal, relocation or reconstruction of the obstructions.
5. Clearance: When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the Engineer, to provide clearance as required by federal, state or local regulations or as deemed necessary by the Engineer to prevent future damage or contamination of either structure.

E. Excavation

All excavation shall meet the most current OSHA regulations. No more than 200 linear feet of trench shall be open at any one time.

1. Classification: Excavation of trenches for pipelines is unclassified. Soils will be classified utilizing OSHA Standards and Regulations. The Contractor shall assume that the site contains the worse type of soils and make provisions for shoring the work area.
2. Trench Excavation
   a. The trench shall be excavated to the required alignment, depth and width and in conformance with all federal, state and local regulations for the protection of the workmen.
   b. Trench Preparation

i. Trench preparation shall proceed in advance of pipe installation for only as far as pipe will be laid that day.
ii. The contractor shall keep the trench dry from both storm water and seepage from the sides of the trench. Discharge from any trench dewatering pumps shall be conducted to natural drainage channels, storm sewers or a pre- approved reservoir. Do not discharge into any municipal sewer system without municipal approval. The contractor shall be responsible for cleaning any storm drain system, which was used for dewatering discharge.
iii. Excavated material shall be placed in a manner that will not obstruct the work nor endanger the workmen, obstruct sidewalks, driveways, or other structures and shall be done in compliance with federal, state, or local regulations.

3. Pavement Removal: Removal of pavement and road surfaces shall be a part of the trench excavation, and the amount removed shall depend upon the width of trench required for installation of the pipe and the dimensions of area required for the installation of valves, hydrants, specials, manholes or other structures. The dimensions of pavement removed shall not exceed the dimensions of the opening required for installation of pipe, valves, hydrants, specials, manholes and other structures by more than twelve (12") inches in any direction, unless otherwise required or pre-approved by the Engineer.
4. Width: See City Standard Bedding and Trench Detail.
5. Bell Holes: Holes for the bells shall be provided at each joint but shall be no larger than necessary for joint assembly and assurance that the pipe barrel will lie flat on the trench bottom. Other than noted previously, the trench bottom shall be true and even in order to provide support for the full length of the pipe barrel, except that a slight depression may be provided to allow withdrawal of pipe slings or other lifting tackle.
6. Subgrade in Earth
   a. Where a firm and stable foundation for the pipe can be obtained in the natural soil, and where special embedment is not shown on the plans, or specified herein, carefully and accurately trim the bottom of the trench to fit the lower portion of the pipe barrel. The bottom of the trench shall be firm, stable and free of standing water.
   b. If water is allowed to collect in an originally dry trench after a reasonable time has passed to complete the embedment of the pipe, as determined by the Engineer, the contractor shall place a minimum of four (4") inches of clean rounded pea gravel in the ditch and pump out all accumulated water before placing the pipe. No deleterious materials will be allowed in the gravel. No extra compensation will be allowed for this work.
   c. Where wet, soft, or spongy material is encountered in the excavation at subgrade level, the contractor shall remove such material at the direction of the Engineer and replace it with crushed stone of sufficient quantity such that when fully compacted, the subgrade is firm and stable.
7. Subgrade in Rock
   a. When excavation of rock is encountered, all rock shall be removed to provide a clearance of at least six (6") inches below and on each side of all pipe, valves and fittings for pipe sizes twenty-four (24") inches or smaller, and nine (9") inches for pipe sizes thirty (30") inches and larger. When excavation is completed, the proper embedment material shall be placed on the bottom of the trench to the previously mentioned depths, leveled and tamped.
   b. These clearances and bedding procedures shall also be observed for pieces of concrete or masonry and other debris or subterranean structures, such as masonry walls, piers or foundations that may be encountered during excavation.

c. The installation procedures specified in this section shall be followed when gravel formations containing loose boulders greater than eight (8") inches in diameter are encountered.

d. In all cases, the specified clearances shall be maintained between the bottom of all pipe and appurtenances and any part, projection or point of rock, boulder or stones of sufficient size and placement, which, in the opinion of the Engineer, could cause a fulcrum point.

F. Concrete Encasement

The Contractor shall place 2,000 psi concrete encasement under and around pipe as shown on the embedment detail and provide necessary anchors to prevent the pipe from floating out of place. The contractor shall remove and relay any pipes that are floated out of proper position

G. Backfilling

1. General
   a. The Contractor shall not begin backfilling until approval has been obtained from the Inspector. Backfilling includes refilling and consolidation of the fill in trenches and excavations up to the natural ground surface or road grade.
   b. Backfill shall be accomplished in accordance with the specified laying condition as shown on the plans.
2. Backfill Material
   a. All backfill material shall meet latest edition of ASTM D2321 unless otherwise specified by the Engineer.
   b. If excavated material is indicated on the drawings or specified for backfill, and there is a deficiency due to a rejection of part thereof, the contractor shall provide the required amount of sand, gravel or other pre-approved material.
3. Backfilling is to be scheduled so there is a minimum amount of open excavation left during hours of no work.
4. Do not leave trenches open overnight without backfilling to the natural ground level. Steel plates (1/2" in thickness) may be used to cover open trenches only with the approval of the Engineer.
5. Compaction: Compaction requirements are as specified on the plans.

END OF SECTION

SECTION 31 5000

TRENCH SAFETY

PART 1 GENERAL

1.01 DESCRIPTION

A. The work specified under this section requires the Contractor to provide for the safety of the workmen in strict compliance with 29 CFR Part 1926 1993 (Revised as of July 1, 1996 of latest Edition or Revision to) Excavations and Applicable Subparts. The submission of a "TRENCH SAFETY PLAN" which shall fully satisfy the requirements of this specification is required prior to a notice to proceed to start the project.

1.02 SUBMITTALS

A. Certificates:
Submit manufacturer's "Certificate of Compliance," stating that the devices (trench boxes, speed shoring, etc.) to be used for trench safety comply with the requirements of this specification. The certificate should show the design assumptions and limitations of the device and should be sealed by an engineer registered and licensed to practice in the state of Texas.

B. Trench Safety Plan:
Submit a detailed TRENCH SAFETY PLAN for all work areas. Calculations shall be provided for any areas beyond the capacity of the trench box or speed shoring and sealed by an engineer registered and licensed to practice in the state of Texas. This plan shall include evacuation routes for personnel.

C. Competent Person:
Contractor shall have a "Competent Person" with regard to OSHA standards, on site at all times. Competent person is generally defined as an individual who, by training and experience, is knowledgeable of applicable standards, capable of identifying hazards, is designated by the employer, and has the authority to take actions as needed. Contractor shall provide written proof showing the competent person(s) for the work being performed.

1.03 REFERENCED SPECIFICATIONS

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM A36/A36M	1997 Standard Specification for Carbon Structural Steel
ASTM A307	1997 Revision A-Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi tensile length
ASTM A328/A328M	1996 (REV) Standard Specification for Steel Sheet Piling
ASTM A572/A572M	1997 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM) (CONT'D)

ASTM A588/A588M	1997 Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 inch (100 mm) thick
ASTM A690/A690M	1994 Standard Specification for High-Strength Low-Alloy Steel H-Pipes and Sheet Piling for Use in Marine Environments

AMERICAN WELDING SOCIETY, INC. (AWS)

AWS D1.1	1998 Structural Welding Code-Steel

OCCUPATION SAFETY AND HEALTH ADMINISTRATION (OSHA)

29 CFR Part 1926	1993 (Revised as of July 1, 1996 of latest Edition or Revision to) Excavations and Applicable Subparts

PART 2 PRODUCTS

2.01 MATERIALS

A. Timber:
Trench sheeting materials shall be full size, a minimum of 2 inches in thickness, solid and sound, free from weakening defects such as loose knots and splits.

B. Sheet Piling:
Steel sheet piling shall conform to one or more of ASTM A328/328M, ASTM A572/A572M/ ASTM A690/A690M material requirements.

C. Structural Steel
Steel for stringers (wales) and cross braces shall conform to ASTM A588.

D. Trench Boxes:
Steel trench Boxes to be constructed of steel conforming to ASTM A36/A36M. Connecting bolts used to conform to ASTM A307. Welds shall conform to the requirements of AWS D1.1.

E. Miscellaneous:
Miscellaneous materials to be utilized shall conform to applicable ASTM standards.

PART 3 EXECUTION

3.01 CONSTRUCTION METHODS

A. General:
The trench safety system shall be constructed, installed and maintained in accordance with the Trench Safety Plan. Bed and backfill pipe to a point at least one (1) foot above top of pipe or other embedded items prior to removal of any portion of trench safety system. Bedding and backfill shall be in accordance to other applicable Specification Sections. Backfilling and removal of trench supports shall be in accordance with Contractor's Trench Safety Plan. Removal of trench safety system to be accomplished in such a manner to cause no damage to pipe or other embedded items. Remove no braces or trench supports until all personnel have evacuated the trench. The trench shall be backfilled to within 5 feet of natural ground prior to removal of entire trench safety system.

B. Supervision:
Provide competent supervisory personnel at each trench while work is in progress to ensure Contractor's methods, procedures, equipment and materials pertaining to the safety systems in this section are sufficient to meet requirements of OSHA Standards.

C. Inspection:
The Contractor shall make daily inspection of trench safety system to ensure that the system meets OSHA requirements. Daily inspection shall be made by competent personnel. If evidence of possible cave-ins or slides is apparent, all work in the trench is to cease until necessary precautions have been taken to safeguard personnel entering trench. The Contractor shall maintain permanent record of daily inspections.

D. Timber Sheeting:
Timber sheeting and size of uprights, stringers (wales,) and cross bracing to be installed in accordance with the Trench Safety Plan. Place cross braces in true horizontal position, spaced vertically, and secure to prevent sliding, falling or kick outs. Cross braces to be placed at each end of stringers (wales) in addition to other locations required. Cross braces and stringers (wales) to be placed at splices of uprights, in addition to other locations required.

E. Steel Sheet Piling:
Steel sheet piling of equal or greater strength may be used in lieu of timber trench shoring shown in the OSHA tables (proposed standards). Drive steel sheet piling to a least minimum depth below trench bottom as recommended by the Contractor's Registered Licensed Professional Engineer providing design. Place cross braces in true horizontal position and spaced vertically. Secure to prevent sliding, falling, or kick outs. Cross braces to be placed at each end of stringers (wales), in addition to other locations required.

F. Maintenance of Safety System:
The safety system to be maintained in the condition as shown on the Trench Excavation and Shoring Safety Plan as designed by the Contractor's Registered Licensed Professional Engineer. The Contractor shall take all necessary precaution to ensure the safety systems

are not damaged during their use. If at any time during its use a safety system is damaged, personnel to be immediately removed from the trench excavation area and the safety system repaired. The Contractor is to take all necessary precautions to ensure no loads, except those provided for in the plan, are imposed upon the trench safety system.

END OF SECTION

SECTION 32 3113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manual gates with related hardware.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Gate locking device.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM F900 - Specification for Industrial and Commercial Swing Gates

D. ASTM F626 - Specification for Fence Fittings

E. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

F. ASTM F626 - Specification for Fence Fittings

G. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2017).

H. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2014a.

I. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework; 2017a.

J. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2016.

K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Shop drawings: Site plan showing layout of fence location with dimensions, location of gates and opening size, cleared area, elevation of fence, gates, footings and details of attachments. Comply with the provisions of Section 01 33 23.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Chain Link Fences and Gates:
   1. Master-Halco, Inc; _____: www.masterhalco.com/#sle.
   2. Merchants Metals; _____: www.merchantsmetals.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS

A. Line Posts: 2.38 inch (60 mm) diameter.
   1. Round steel pipe and rail: Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² (550 g/m²) hot dip galvanized zinc exterior and 1.8 oz/ft² (550 g/m²) hot dip galvanized zinc interior coating.
      a. Regular Grade: Minimum steel yield strength 30,000 psi (205 MPa)

B. Corner and Terminal Posts: 4.0 inch (100 mm) diameter.
   1. Round steel pipe and rail: Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² (550 g/m²) hot dip galvanized zinc exterior and 1.8 oz/ft² (550 g/m²) hot dip galvanized zinc interior coating.
      a. Regular Grade: Minimum steel yield strength 30,000 psi (205 MPa)

C. Gate Posts: 4-1/2 inch (114 mm) diameter, to receive hollow metal frames.

D. Top and Brace Rail: 1.66 inch (42 mm) diameter, plain end, sleeve coupled.

E. Bottom Rail: 1.66 inch (42 mm) diameter, plain end, sleeve coupled.

F. Fabric: 2 inch (51 mm) diamond mesh interwoven wire, 6 gage, 0.1920 inch (4.9 mm) thick, top selvage knuckle end closed, bottom selvage twisted tight.

G. Tension Wire: 6 gage, 0.1920 inch (4.9 mm) thick steel, single strand.

H. Tension Strap: 3/16 inch (4.8 mm) thick steel.

2.03 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Extension Arms: Cast steel galvanized, to accommodate 3 strands of barbed wire, single arm, vertical.

2.04 FINISHES

A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot (530 g/sq m).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Line Post Footing Depth Below Finish Grade: ASTM F567.

C. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

D. Position bottom of fabric 2 inches (50 mm) above finished grade attach to bottom rail.

E. Fasten fabric to top rail, and bottom rail with tie wire at maximum 15 inches (380 mm) on centers.

F. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

G. Install bottom tension wire stretched taut between terminal posts.

H. Install get locking device specified in Section 08 0671.

3.02 CLEANING

A. Leave immediate work area neat at end of each work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

END OF SECTION

SECTION 33 13 00
DISINFECTION OF WATERLINES

PART 1 GENERAL

1.01 DESCRIPTION

A. This specification specifies the procedure for disinfection of water systems, and in general, conforms to AWWA C651, Disinfecting Water Mains including Section 4.3.9.

PART 2 PRODUCTS

2.01 MATERIALS

A. Chlorine: Calcium hypochlorite, or equal, which contains sixty-five (65%) percent chlorine by weight.

B. Water: Water for disinfection will be metered and furnished to the Contractor at no cost. Existing water lines are to remain isolated from newly laid water lines by a physical air gap until the original copy of the negative coliform test results have been received by the Engineer from either the County Health Department or an approved TCEQ lab.

2.02 TESTING REQUIREMENTS

A. Chlorine Residual-Drop Dilution Method:
The drop dilution method of approximating total residual chlorine is suitable for concentrations above 10 mg/L, such as are applied in the disinfection of water mains or tanks.

1. Apparatus
   a. A graduated cylinder for measuring distilled water.
   b. An automatic or safety pipet
   c. A dropping pipet that delivers a one-milliliter (1 ml) sample in twenty (20) drops. This pipet is for measuring the water sample and should not be used for any other purpose.
   d. A comparator kit containing a suitable range of standards.
2. Procedure
   a. Ascertain the volume of the comparator cell and using an automatic or safety pipet, add 0.5 ml of orthotolidine for each 9.5 ml of distilled water to be added.
   b. Using a graduated cylinder, add a measured volume of distilled water.
   c. With the dropping pipet, add the water sample a drop at a time, allowing mixing, until a yellow color is formed that matches one of the color standards.
   d. Record the total number of drops used and the final chlorine value obtained.
   e. Calculate the milligrams per liter residual chlorine as follows:
      i. Multiply by twenty the number of milliliters of distilled water used in Step 2.
      ii. Multiply product in step a. by the final chlorine value in milligrams per liter recorded in Step 4.
      iii. Divide the product found in step b. by the total number of drops of water sample recorded in Step 4.

PART 3 EXECUTION

3.01 GENERAL

A. During the construction operations, workmen shall be required to use utmost care to see that the inside of pipes, fittings, jointing materials, valves, etc., which will come into contact with potable water be maintained in a sanitary condition.

B. Every effort must be made to keep the inside of the pipe, fittings, and valves free of all foreign matter, sticks, dirt, rocks, etc. As each joint of pipe is being laid, it must be effectively swabbed so that all foreign matter is removed. Placing dry powdered chlorine in the pipeline will be permitted in conjunction with certain methods of sterilization as specified by the Engineer. All fittings and exposed open ends of pipe must be blocked with a plug or

capped until the line is completed.

C. Sterilization of the line, or any section thereof, shall not be commenced until the Engineer has approved the method, apparatus, sterilizing agent, and the section of the line.

D. When the entire pipeline, or certain section thereof, has been completed, tested, and made ready for use, the line or section of line shall be thoroughly sterilized according to the following procedure:

1. The Contractor shall provide all necessary taps to complete this section of the specifications.
2. The water main shall be flushed prior to disinfection.
3. The flushing velocity shall be greater than 2.5 feet per second. The rate of flow required to produce this velocity in various diameters is shown in Table 1. No site for flushing should be chosen, unless it has been determined by the Engineer or Inspector that drainage is adequate at that site. Flushing is no substitute for preventive measures taken before and during pipe laying. Certain contaminants, especially in caked deposits, resist flushing at any velocity.

TABLE 1

REQUIRED OPENINGS TO FLUSH PIPELINES (40 PSI RESIDUAL PRESSURE)

Pipe Size	Flow (gpm) Required to Produce 2.5 fps Velocity	Orifice Size (in.)	Number of Hydrant Outlet Nozzles	Size (in.) of Hydrant Outlet Nozzles
4	10	15/16	1	2-½
6	220	1-3/8	1	2-½
8	390	1-7/8	1	2-½
1	610	2-5/16	1	2-½
1	880	2-13/16	1	2-½
1	1200	3-¼	2	2-½
1	1565	3-5/8	2	2-½
1	1980	4-3/16	2	2-½

Note: A 2-½" hydrant outlet nozzle will discharge approximately 1,000 gpm and a 4-½" hydrant outlet nozzle will discharge approximately 2,500 gpm with 40 psi residual pressure.

E. Methods of Chlorine Application

1. Continuous Feed Method:
   a. This method is suitable for general applications.
   b. Water from the existing distribution system, or other pre-approved sources of supply, shall be made to flow at a constant, measured rate into the newly laid pipeline. The water shall receive a dose of chlorine concentration until the water in the pipe maintains a minimum of fifty milligrams per liter (50 mg/1) available chlorine. To assure that this concentration is maintained, the chlorine residual should be measured at regular intervals in accordance with the procedures described herein.
   c. During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the line supplying the water. Chlorine application shall not cease until the entire main is filled with the chlorine solution. The chlorinated water shall be retained in the main for at least twenty-four (24) hours during which time, all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this twenty-four (24) hour period, the treated water shall contain no less than fifty (50) milligrams per liter and no more than one hundred (100) milligrams per liter chlorine throughout the length of the main. A dosage of more than the maximum allowable chlorine will require the Contractor to dilute the flush water with one of the TCEQ approved dilution chemicals. The chemical and description of procedure will be submitted in writing to the Engineer for approval.

d. In the absence of a meter, the rate may be determined either by placing a pitot gauge at the discharge, or by measuring the time to fill a container of known volume.

e. Table 2 gives the amount of chlorine residual required for each 100 feet of pipe of various diameters. Solutions of one percent (1%) chlorine may be prepared with approximately one pound (1 lb.) of calcium hypochlorite (65% strength) in 8.5 gallons of water.

TABLE 2
Chlorine Required to Produce 50 Mg/1 Concentration in 100 feet of Pipe by Diameter

Pipe Size (in.)	100% Chlorine (lb/100ft)	1% Chlorine Solution (gal/100ft)
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88
16	0.427	5.12
18	0.540	6.48
24	0.960	11.50
30	1.500	18.00
36	2.160	25.90
42	2.940	35.30

2. Slug Method: This method is suitable for use with mains of large diameter for which, because of the volume of water involved, the continuous feed method is not practical.
   a. Water from the existing distribution system shall be made to flow at a constant, measured rate (see C.1.a. Note) into the newly laid pipeline. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two (2) rates shall be proportioned so that the concentration of the water entering the pipeline is maintained at no less than 300 milligrams per liter. As the chlorinated water passes along the line, it shall expose all interior surfaces to a concentration of at least 300 mg/L for at least three (3) hours. The application shall be checked at a tap near the upstream and downstream end of the line by chlorine residual measurements made according to the procedures described herein.
   b. As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated so as to disinfect appurtenances.
3. Dry Treatment during Installation: The dosage and application of sodium hypochlorite will be determined by the following:
   a. Calculate weight of sodium hypochlorite required for water to be treated utilizing Table 2.
   b. Add required amount of solution at the bell of each pipe as it is installed.

F. Final Flushing

After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is less than three milligrams per liter (3 mg/1). Chlorine residual determination shall be made by the Inspector to ascertain that the heavily chlorinated water has been removed from the pipeline.

G. Bacteriologic Tests

1. Before the water main is placed in service, a sample or samples shall be collected from points designated by the Inspector and tested for bacteriologic quality. This sample shall be collected 24 hours after final flushing. The test shall show the absence of coliform organisms before the water main may be placed in service. At least one (1) sample per one thousand (1000) feet of new line or portion thereof shall

be taken. Sampling shall be supervised by the Inspector. Samples shall be submitted by the city to a TCEQ approved laboratory and/or County Health Department for analysis.

2. Samples of bacteriologic analysis shall be collected in sterile bottles obtained from the Brazos County Health Department. Samples shall be collected at points specified by the Engineer.
3. A suggested sampling tap consists of a standard corporation cock installed in the main with a copper tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

H. Repetition of Procedure

1. If the initial disinfection fails to produce samples with no coliform present, the contractor shall re-disinfect the line following the procedures stated in 695.04 of this specification until samples indicating no coliform present have been obtained. When the samples indicate no coliform present and the Engineer has received original copies of the test report, the main may be placed in service.

3.02 PROCEDURE AFTER CUTTING INTO OR REPAIRING EXISTING MAINS

A. The procedure outlined in this section applies primarily when mains are wholly or partially dewatered. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure present little danger of contamination and require no disinfection.

1. Trench “Treatment”: When an old line is opened, either by accident or by design, the excavation will likely be wet and badly contaminated. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from such pollution. Tablets have the advantage in such a situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.
2. Main Disinfection: *Swabbing and Flushing.* The following procedure is considered as a minimum that may be used.
   a. Swabbing With Hypochlorite Solution: The interior of all pipe and fittings used to make the repair (particularly couplings and tapping sleeves) shall be swabbed with a 5 percent hypochlorite solution before they are installed.
   b. Flushing: Thorough flushing is the most practical means of removing contamination introduced during repairs. If valving and hydrant locations permit, flushing from both directions is recommended. Flushing shall be started as soon as the repairs are completed and continued until discolored water is eliminated.
3. Slug Method: In addition to the swabbing and flushing procedures of section B.1., the section of main in which the break is located can be flushed and chlorinated using the slug method where practical, as determined by the Engineer or Inspector. This method requires isolating the section of main, shutting off all service connections, flushing the main, and chlorinating the main as described in the Slug Method in C.2, except that the dose may be increased to as much as 500 mg/1, and the contact time reduced to as little as ½ hour. After chlorination, flushing shall be resumed and continued until discolored water is eliminated.
4. Sampling: Bacteriologic samples shall be taken after repairs to provide a record by which the effectiveness of the procedures used can be determined by the Inspector. If the direction of flow is unknown, samples shall be taken on each side of the main break.

END OF SECTION

SECTION 33 1310
HYDROSTATIC TESTING

PART 1 GENERAL

1.01 DESCRIPTION

This item shall consist of the hydrostatic testing of all waterlines, fire hydrants, and appurtenances.

TABLE A
Loss in Gallons Per Hour Per Foot of Pipe

Length	4”	6”	8”	10”	12”	18”	20”	24”
50	.04	.06	.08	.10	.12	.18	.195	.235
100	.08	.12	.16	.195	.235	.355	.395	.475
200	.16	.235	.315	.395	.475	.71	.785	.945
300	.235	.355	.475	.59	.71	1.065	1.185	1.42
400	.315	.475	.63	.785	.945	1.42	1.58	1.89
500	.395	.59	.785	.985	1.185	1.775	1.975	2.365
600	.475	.71	.945	1.185	1.42	2.13	2.365	2.84
700	.555	.83	1.105	1.38	1.655	2.485	2.76	3.31
800	.63	.945	1.265	1.58	1.895	2.84	3.155	3.785
900	.71	1.065	1.42	1.775	2.13	3.195	3.55	4.26
1000	.79	1.185	1.58	1.975	2.365	3.55	3.945	4.735

Note: Calculations Based on a Loss of 25 Gal./Diameter inch of Pipe/Mile of Pipe/Day

PART 2 PRODUCTS

2.01 MATERIALS

A. Equipment Provided by Contractor:
The contractor shall furnish pump, pipe connections and all necessary apparatus (including gauges and meters) to hydrostatically test the water lines according to this specification.

B. Water for Testing:
Water for testing will be furnished by the City. All connections of new pipeline must be isolated from existing potable water lines until a negative coliform test report from the County Health Department or TCEQ approved lab has been received.

PART 3 EXECUTION

3.01 GENERAL

A. All water mains including water services shall be hydrostatically tested and sterilized according to SECTION 33 1300 - DISINFECTION OF WATERLINES, prior to review for non-compliance by the State or the City.

B. This section specifies hydrostatic testing of water distribution lines. The contractor shall test waterlines after backfilling, but before replacement of pavement (if applicable.)

C. Test waterlines in sections, by pressurizing the new system to 150 psi and holding that pressure for a total test time of 4 hours.

3.02 PRESSURIZATION

A. Each valved section of pipe shall be filled with water slowly. The test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer.

3.03 AIR REMOVAL

A. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled

as the line is filled with water. After all the air has been expelled, the corporation stops shall be closed, and the test pressure applied twenty-four (24) hours after filling the line.

B. At the conclusion of the pressure test, the corporation stops shall be removed and plugged, or left in place at the discretion of the Engineer. Any added corporation cocks must be shown on as-built plans if they are to remain in place.

3.04 EXAMINATION

A. All exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves or hydrants that are discovered following the test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Engineer.

1. Allowable Pressure Loss
   a. For DIP and PVC, no pipe installation will be reviewed for non-compliance if the water loss is greater than that shown in Table A. No additional leakage will be included for fittings.
   b. When hydrants are in the test section, the test shall be made against the closed hydrant and not the valve on the lead.
2. Installation Review of Non-Compliance
   a. Non-compliance shall be determined on the basis of allowable pressure loss. If any test of pipe discloses a pressure loss greater than that specified, the Contractor shall, at his own expense, locate and repair the defective material until the pressure loss is within the specified allowance.
   b. All visible leaks are to be repaired, regardless of the amount of pressure loss.

END OF SECTION