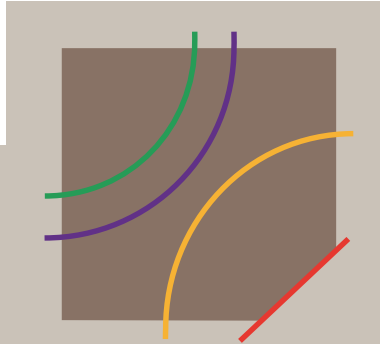


Project Manual For
Freestanding Medical Office Building For:
Sullivan County Community Hospital
Sullivan, Indiana

JJCA Project #23987.02
February 28, 2024

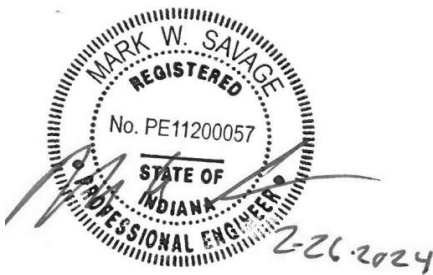


JJCA

Project Manual For
Freestanding Medical Office Building For:
Sullivan County Community Hospital
Sullivan, Indiana

Construction Documents

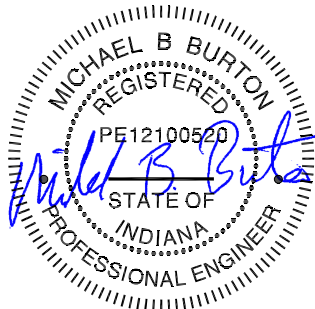
JJCA Project #23987.02
February 28, 2024



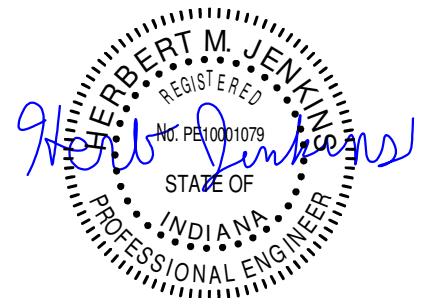
JOHNSON JOHNSON CRABTREE ARCHITECTS PC (Archt)
4551 Trousdale Drive
Nashville, TN 37204
Phone: 615-837-0656, Fax: 615-837-0657



EMC STRUCTURAL ENGINEERS (Struc)
601 Grassmere Park, Suit 1B
Nashville, TN 37211
Phone: 615-781-8199



SMITH SECKMAN REID, INC (Mech)(Plumb)(Elec) (Tech)
2995 Sidco Dr
Nashville, TN 37204
Phone: 615- 383-1113



02.28.24

02.26.24

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SECTION 00-1100
BID SOLICITATION

PROJECT:

FREESTANDING MEDICAL OFFICE BUILDING FOR SCCH

SULLIVAN, INDIANA

ARCHITECT'S PROJECT NUMBER: 23987.02

OWNER:

SULLIVAN COUNTY COMMUNITY HOSPITAL

2200 NORTH SECTION STREET

SULLIVAN, IL 47882

ARCHITECT:

JOHNSON JOHNSON CRABTREE ARCHITECTS PC

4551 TROUSDALE DRIVE

NASHVILLE, TN 37204

PHONE: 615-837-0656, FAX: 615-837-0657

BRIEF PROJECT DESCRIPTION:

THE PROJECT CONSISTS OF:

- A. An approximately 26,200 sf construction of a medical office building with approximately 16,500 sf of buildout at the main campus of the Sullivan County Community Hospital. See Section 01-1000 for a detailed description. Shell, Buildout and Site are in different packages for permitting.

INVITATION:

1.02 BID PROCEDURES

- A. Bids are invited for a General Contract for the Work of the above project.
- B. Bids signed and under seal, executed, and dated will be received at the office of the Owner as noted above no later than 1:00 pm ET on April 3, 2024.
- C. Bid Opening will be public at 1:30pm ET on April 3, 2024 at POB #1 in the financial services room, 2110 North Hospital Blvd., Sullivan, Indiana.
- D. A mandatory pre-bid conference will be held at the Site at 1:00pm ET on Monday March 18, 2024.
 1. An overview of the project, site constraints/ phasing, building constraints/ phasing, questions, and a site tour as permitted will be reviewed.

- E. Proposals received after the above time will not be accepted and returned unopened.
- F. Notification of low bidder may be given within 15 business days after receipt of bids.
- G. A separate contractor, currently under contract, is preparing the site to include placement of sediment and erosion control, clearing, earthwork, drainage installation, placement of stone and roadways, installation of curb, sidewalks, bollards, pavement markings, signage, light poles, electrical service components, and seeding. Separate contractor's scope also includes installation of utilities for support of the new building including water lines, storm drainage systems, electrical, and communications conduits. It includes the preparation of the building pad to the elevation and bearing capacity indicated. The drawings for this work are also available for viewing at locations below.
- H. Bidding Documents, are on file for viewing at the Owner's Office.
- I. Bidding Documents (Prints or electronic pdfs) may be viewed or purchased starting March 5, 2024 at:
 - Rapid Reproduction
 - 12 S.11th St.
 - Terre Haute, IN 47807
 - www.rapidplanroom.com/private.php/
 - Job Key: SCCH MOB
- J. Partial sets will not be issued. If the General Contractor so chooses to print particular sheets for sub-contractors, it is the General Contractor's responsibility that the entire Work is bid. Claims from sub-contractors stating that only certain sheets were represented in the bid will not be accepted.
- K. A five percent (5%) Bid Security is required in the form of a certified check, cashier's check or Bid Bond.
- L. The Owner reserves the right to reject any or all bids and to waive irregularity in bidding.

END OF SECTION

SECTION 00-1110
QUALIFICATION REQUIREMENTS

**THE FOLLOWING INFORMATION MUST BE COMPLETED IN IT'S ENTIRETY FOR
CONSIDERATION FOR TE PROPOSED PROJECT**

1.01 GENERAL INFORMATION

- A. The contract will only be awarded to responsible Contractor found to be experienced in the type of project described and in a financial position to complete the work specified as determined by the Owner. All bidders need to complete the Qualification Information below and submit to Owner along with the bid form.
- B. Bidder must have operated as a General Contractor for a minimum of five consecutive years under the present name.
- C. Bidder shall have a qualified project manager and superintendent to handle the project and shall submit a copy of current resumes for each along with bid form. To be considered qualified, project manager and superintendent shall have experience with projects identified above, or other similar projects.
- D. Bidder shall not now be, nor have been in the past, disqualified for cause from bidding on any Federal, State, or City Agency.
- E. Bidder must be capable of providing a performance bond equal to 100% of the contract and a labor and material payment bond of not less than 100% of contract.
- F. Bidder must be able to provide qualified field installation superintendents permanently employed on its active payroll, as well as sufficient qualified work force to meet schedule requirements.
- G. Only bids from qualified bidders will be considered, wherein each bid and qualification shall be determined the Owner's evaluation of the bidder's requirements as described all inclusive of the items listed above for the determination of the lowest responsible bidder and for consideration in making the contract award.

1.02 COMPANY INFORMATION

- A. Company Name: _____
- B. Date: _____
- C. Address: _____
- D. Phone: _____
- E. FAX: _____
- F. E-mail Address: _____

1.03 GENERAL:

- A. Attach a list of Owners or Officers (President, Vice President, Secretary-Treasurer and Key-Personnel.)
- B. Attach resume of proposed Project Manager & Superintendent

QUALIFICATION REQUIREMENTS 00-1110 - 2
Freestanding Medical Office Building for SCCH - 23987.02

- C. Labor Source: _____
- D. Number of Permanent Shop Employees: _____
- E. Number of Permanent Field Employees: _____
- F. Type of Work Performed (with own forces): _____

- G. Type of Work Subcontracted to Others: _____

- H. Number of Years in Business: _____ State License Number: _____

1.04 FINANCIAL:

- A. Bonding Limits: Total: _____ Per Job: _____
- B. Bonding Company: _____
- C. Address: _____
- D. Phone: _____
- E. Person to Contact: _____
- F. Principal Bank: _____
- G. Address: _____
- H. Phone: _____
- I. Person to Contact: _____
- J. Your firm's latest year-end audited financial statement shall be available for review upon request by Owner

1.05 AUTHORIZATION

- A. I hereby give authorization to Sullivan County Community Hospital to obtain written or oral credit information from the above company's bank, bonding company, trade references, or other credit reporting agency.
- B. The undersigned certifies that the herein above contained information is truthful to the best of his knowledge.

Signed: _____

Title: _____

Date: _____

END OF SECTION

SECTION 00-2000
INSTRUCTIONS TO BIDDERS

BIDDER INSTRUCTIONS

1.01 GENERAL

- A. See Section 00-1100 - Bid Solicitation.
- B. See Section 00-4100 - Bid Form.
- C. See Section 00-4100 - Bid Form.

1.02 SECURING DOCUMENTS

- A. Bidding Documents, are on file for viewing at the Owner's Office.
- B. Bidding Documents (Prints or electronic pdfs) may be viewed or purchased at:
Rapid Reproduction
12 S.11th St.
Terre Haute, IN 47807
www.rapidplanroom.com/private.php/
Job Key: SCCH MOB
- C. Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misrepresentations resulting from the use of incomplete sets of Bidding Documents.

1.03 BID FORM AND SUBMITTAL REQUIREMENTS

- A. In order to receive consideration, make all bids in strict accordance with the following:
 - 1. Make bids upon the form provided therefore, properly executed and with all items filled out.
 - 2. Do not change the wording of the Bid Form found in Section 00-4100 - Bid Form and do not add to the Bid Form.
 - 3. Unauthorized conditions, limitations, or provisions attached to the proposal shall be cause for rejection of the proposal.
 - 4. Bids received after the time fixed for receiving them will not be considered.
 - 5. Late bids will be returned to the sender unopened.
 - 6. Each bid shall be addressed to the Owner, and shall be delivered to the Architect or Owner at the physical or e-mail address given in the Bid Solicitation on or before the day and hour set for receiving bids.
 - 7. Each bid shall be enclosed in a sealed envelope bearing the title of the work and the name of the Bidder and address.
 - 8. It is the sole responsibility of the bidder to see that his bid is received on time.

1.04 BONDS

- A. Bid Security:
 - 1. Each bid shall be accompanied by a bid security in the form and amount required in Section 00-1100 - Bid Solicitation properly made payable to Owner.

INSTRUCTIONS TO BIDDERS 00-2000 - 2

Freestanding Medical Office Building for SCCH - 23987.02

2. The Bidder pledges to enter into a Contract with the Owner on the terms slated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.
3. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.
4. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with provisions of the Agreement
5. Surety bond shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.
6. The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

1.05 PRIOR TO BID

A. EXAMINATION OF DRAWINGS, PROJECT MANUAL AND SITE OF WORK

1. Before submitting a Bid, each Bidder shall carefully examine the Drawings, read the Project Manual and all other proposed Contract Documents, and visit the site of the Work.
2. Each Bidder shall fully inform himself prior to bidding as to all existing conditions and limitations under which the Work is to be performed, and he shall include in his Bid a sum to cover all costs of all items necessary to perform the Work as set forth in the proposed Contract Documents.
3. Allowance will not be made to any Bidder because of lack of such examination or knowledge.
4. The submission of a Bid will be construed as conclusive evidence that the Bidder has made such examination.
5. The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

B. INTERPRETATION OF CONTRACT DOCUMENTS PRIOR TO BIDDING

1. If any person contemplating submitting a Bid for construction of the Work is in doubt as to the true meaning of any part of the proposed Contract Documents, or finds discrepancies in or omissions from any part of the proposed Contract Documents, he may submit to the Architect a written request for information for the not later than nine (9) calendar days before Bids are scheduled to be received.
 - a. The person submitting the request shall be responsible for its prompt delivery.
2. Interpretation or correction of proposed Contract Documents will be made only by Addendum, and will be delivered electronically to each Bid Document recipient known by the Architect.

INSTRUCTIONS TO BIDDERS 00-2000 - 3

Freestanding Medical Office Building for SCCH - 23987.02

3. Addenda will be issued no later than five (5) calendar 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.
4. Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.
5. The Owner will not be responsible for any other explanations or interpretations of the proposed Contract Documents.

C. SUBSTITUTIONS

1. Comply with Section 01-2513 Product Substitution Procedures prior to Bid and in accordance with Interpretation of Contractor Documents procedures above.

D. PRE-BID CONFERENCE AND SITE EXAMINATION

1. A pre-bid conference will be held as noted in Section 00-1100 - Bid Solicitation.
2. Summarized minutes of this meeting will be circulated to attendees. These minutes will not form part of the Contract Documents.
3. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

1.06 BIDS

A. PREPARATION AND SUBMITTAL OF BIDS

1. Submit one hardcopy of the executed offer on the Bid Form provided to the Owner, signed and sealed with the required qualification form in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.
2. After hard copy submission, submit an electronic copy of the executed offer on the Bid Form provided to the Architect, signed and sealed with the required qualification form in an e-mail with the subject of the e-mail being the project name and the body of the e-mail clearly identified with bidder's name, project name and Owner's name.
3. Improperly completed information, irregularities in security deposit, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.
4. All blanks on the bid form shall be legibly executed with a non-erasable medium.
5. Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.
6. Interlineations, alterations and erasures must be initialed by the signer of the Bid.
7. Offers submitted after the above time shall be returned to the bidder unopened.

B. BID INELIGIBILITY

1. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, incomplete or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.
2. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, be waived.

C. MODIFICATION OR WITHDRAWAL OF BIDS

INSTRUCTIONS TO BIDDERS 00-2000 - 4

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1. A Bid may not be modified, withdrawn or canceled by the Bidder after the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.
2. Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids.
 - a. Such notice shall be in writing over the signature of the Bidder.
 - b. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids.
 - c. A change shall be so worded as not to reveal the amount of the original Bid.
 - d. Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with the Instructions to Bidders.
 - e. Bidder cannot withdraw his Bid for a period of thirty (30) calendar days after the date set for receiving thereof.
 - f. Each Bid shall be subject to acceptance by the Owner during this period.

D. AWARD OR REJECTION OF BIDS

1. The bid opening shall be public.
2. Owner reserves the right to reject a proposed subcontractor for reasonable cause.
3. The Contract(s), if awarded, will be awarded to the responsible Bidder who has proposed the lowest Contract Sum, subject to the Owner's right to reject any or all Bids and to waive informality and irregularity in the Bids and in the bidding.

E. PROOF OF COMPETENCY OF BIDDER

1. Any Bidder may be required to furnish evidence satisfactory to the Owner that he has sufficient experience in the types of work called for to assure completion of the Contract in a satisfactory manner.

1.07 FEES FOR CHANGES IN THE WORK

- A. Include in the Bid Form, the overhead and profit fees on General Contractor Work and Work by subcontractors, applicable for changes in the Work, whether additions to or deductions from the Work on which the Bid Amount is based.
- B. Include in the Bid Form, the fees proposed for subcontract work for changes in the Work, whether additions to or deductions from the Work on which the Bid Amount is based. Contractor shall apply fees as noted, to the subcontractor's gross (net plus fee) costs on additional work.

1.08 EXECUTION OF AGREEMENT

- A. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) calendar days after the bid closing date.
- B. The form of Agreement which the successful Bidder will be required to execute is included in this Project Manual.

INSTRUCTIONS TO BIDDERS 00-2000 - 5

Freestanding Medical Office Building for SCCH - 23987.02

- C. The Bidder to whom the Contract is awarded by the Owner shall, within fifteen (15) calendar days after notice of award and receipt of Agreement forms from the Owner, sign and deliver to the Owner all required copies.
- D. At or prior to delivery of the signed Agreement, the Contractor shall deliver to the Owner the bonds, policies of insurance or insurance certificates as required by the Contract Documents and terms of the Agreement.
- E. Specific Insurance requirements will be determined by the Owner.
- F. All policies of insurance must be approved by the Owner before the successful Bidder can proceed with the Work.
- G. Failure or refusal to furnish bonds or insurance policies or certificates in a form satisfactory to the Owner shall subject the Bidder to loss of time from the allowable construction period equal to the time of delay in furnishing the required material.

1.09 CONSTRUCTION TIME AND LIQUIDATED DAMAGES

- A. The Agreement will include a stipulation that the Work be substantially completed in the period identified on the Bid Forms and/or to be determined following receipt of Notice to Proceed. The Contractor shall include consideration of winter/inclement weather as a part of their proposed schedule. The Owner will move in and have full occupancy no more than thirty (30) calendar days after agreed upon Substantial Completion Date.

END OF INSTRUCTIONS TO BIDDERS

**SECTION 00-4100
BID FORM**

ONE HARDCOPY TO:	ONE ELECTRONIC COPY TO:
SULLIVAN COUNTY COMMUNITY HOSPITAL	JJCA
ATTN: MICHELLE FRANKLIN	ATTN: DAVID JOHNSON
2200 NORTH SECTION STREET	DJOHNSON@JJCA.COM
SULLIVAN, IN 47882	P: (615) 837-0656
P: (812) 268-4311	F: (615) 837-0657

TO: SULLIVAN COUNTY COMMUNITY HOSPITAL

1.01 PURSUANT TO AND IN COMPLIANCE WITH THE INVITATION TO BID AND THE PROPOSED CONTRACT DOCUMENTS RELATING TO CONSTRUCTION OF:

Freestanding Medical Office Building for SCCH

Sullivan, Indiana

Architect's Project Number: 23987.02

Including Addendum(s) _____

- A. The undersigned, having become thoroughly familiar with the terms and conditions of the proposed Contract Documents and with local conditions affecting the performance and costs of the Work at the place where the Work is to be completed, and having fully inspected the site in all particulars, hereby proposes and agrees to fully perform the Work within the time stated and in strict accordance with the proposed Contract Documents, including furnishing any and all labor and materials, and to do all of the work required to construct and complete said Work in accordance with the Contract Documents, for the following sum of money:
 - 1. Base Bid: All labor, materials, services, and equipment necessary for completion of the Work shown on the Drawings and in the Project Manual, except for the items described as "Alternates":

_____ Dollars (\$_____)

 Proposed Construction Duration (including potential impact of anticipated rain days and inclement weather) _____ calendar days
 - 2. Alternate No. 1: If the Owner elects to proceed with Alternate No. 1, add the sum of:

_____ Dollars (\$_____)
- B. Bid Form Supplements: We agree to submit the following supplements with the Bid Form.
 - 1. Document 00-4336 - Proposed Subcontractors Form
- C. I understand that the Owner reserves the right to reject this Bid, but that this Bid shall remain open and not be withdrawn for a period of thirty (30) calendar days from the date prescribed for its receiving.

- D. The Bidder, if awarded a contract, hereby agrees to commence work under this contract on or before a date to be specified in a written notice to proceed from the Owner and to Substantially Complete the project within the schedule identified with the bid and allow full Owner occupancy thirty (30) calendar days after Substantial Completion.
- E. When the 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 as follows on all changes in the Work, including additions and deletions from the Work on which the Bid Amount is based.
 - 1. Overhead and profit on net cost of Bidder work _____ %
 - 2. Fee for Bidder on subcontract work _____ %
- F. If written notice of the acceptance of this bid is mailed or delivered to the undersigned within the above noted days after the date set for the receiving of this bid, or at any other time thereafter before it is withdrawn, the undersigned shall execute and deliver the Contract Documents to the Owner in accordance with this Bid as accepted, and will also furnish and deliver to the Owner the Performance Bond, Labor and Material Payment Bond and proof of insurance coverage, all within fifteen (15) calendar days after personal delivery or after deposit in the mails of the notification of acceptance of this Bid.
- G. Notice of acceptance, or request for additional information, may be addressed to the undersigned at the address set forth below.
- H. The names of all persons interested in the foregoing Bid as principals are:
(IMPORTANT NOTICE: If Bidder or other interested person is a corporation, give legal name of corporation, state where incorporated, and names of president and secretary; if a partnership, give name of firm and names of all individual co-partners composing the firm; if Bidder or other interested person is an individual, give first and last names in full)

licensed in accordance with an act for the registration of contractors, and with
license number _____ in the State of Indiana.

- I. Signature of Bidder

NOTE: If Bidder is a corporation, set forth the legal name of the corporation together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If bidder is a partnership, set forth the name of the firm together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership.

Business Address:

Telephone number: _____

Date of proposal: _____

END OF BID FORM

**SECTION 00-4336
PROPOSED SUBCONTRACTORS FORM**

PARTICULARS

**HEREWITH IS THE LIST OF SUBCONTRACTORS REFERENCED IN THE BID
SUBMITTED BY: (BIDDER) _____**

TO (OWNER): SULLIVAN COUNTY COMMUNITY HOSPITAL

Dated _____ and which is an integral part of the Bid Form.

The following work will be performed (or provided) by Subcontractors and coordinated
by us:

LIST OF SUBCONTRACTORS

WORK SUBJECT	SUBCONTRACTOR NAME	BID VALUE
MASONRY		
WOOD		
CONCRETE/FOUNDATIONS		
CASEWORK		
ROOFING		
DOOR HARDWARE		
GYPSON BOARD		
FLOORING		
PAINTING		
MECHANICAL		
PLUMBING		
ELECTRICAL		
LOW VOLTAGE		

END OF SECTION

SECTION 00-5200
AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

- A. The form of Agreement between Owner and Contractor is anticipated to be per the attached version of the AIA Document A133 Standard Form of Agreement Between the Owner and Contractor where the basis of payment is Cost of the Work Plus a Fee with a Guaranteed Maximum Price.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



AIA® Document A133® – 2019

Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price

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

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

Sullivan County Community Hospital
2200 N. Section Street
Sullivan, IN 48772

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

TBD

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

Sullivan County Community Hospital
Proposed First Phase of Implementation to the Sullivan County Community Hospital
campus as defined in the Master Plan documents prepared by JJCA dated December 13,
2022.

The Project will consist of three parts. The three parts are:

- Project Zero: Infrastructure Upgrades
- Project One: New Medical Office Building
- Project Two: Hospital Addition

Sullivan, IN

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

Johnson Johnson Crabtree Architects P.C. (JJCA)
4551 Trousdale Drive
Nashville, TN 37204

The Owner and Construction Manager agree as follows.

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

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

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EXHIBIT A GUARANTEED MAXIMUM PRICE AMENDMENT

EXHIBIT B INSURANCE AND BONDS

ARTICLE 1 INITIAL INFORMATION

§ 1.1 This Agreement is based on the Initial Information set forth in this Section 1.1.

(For each item in this section, insert the information or a statement such as "not applicable" or "unknown at time of execution.")

§ 1.1.1 The Owner's program for the Project, as described in Section 4.1.1:

(Insert the Owner's program, identify documentation that establishes the Owner's program, or state the manner in which the program will be developed.)

The Project program as defined in the Master Plan dated December 13, 2022.

§ 1.1.2 The Project's physical characteristics:

(Identify or describe pertinent information about the Project's physical characteristics, such as size; location; dimensions; geotechnical reports; site boundaries; topographic surveys; traffic and utility studies; availability of public and private utilities and services; legal description of the site, etc.)

Proposed first phase of implementation to Sullivan County Community Hospital as generally described in the Master Plan documents prepared by JJCA dated December 13, 2022.

§ 1.1.3 The Owner's budget for the Guaranteed Maximum Price, as defined in Article 6:

(Provide total and, if known, a line item breakdown.)

As defined by the Master Plan dated December 13, 2022 and based on financing limits established by Innovative Capital.

§ 1.1.4 The Owner's anticipated design and construction milestone dates:

.1 Design phase milestone dates, if any:

See Exhibit G

.2 Construction commencement date:

See Exhibit G

.3 Substantial Completion date or dates:

See Exhibit G

.4 Other milestone dates:

See Exhibit G

§ 1.1.5 The Owner's requirements for accelerated or fast-track scheduling, or phased construction, are set forth below:
(Identify any requirements for fast-track scheduling or phased construction.)

Any fast track requirements will meet USDA requirements rd-1942A, Guide 27

§ 1.1.6 The Owner's anticipated Sustainable Objective for the Project:
(Identify and describe the Owner's Sustainable Objective for the Project, if any.)

None identified

§ 1.1.6.1 If the Owner identifies a Sustainable Objective, the Owner and Construction Manager shall complete and incorporate AIA Document E234™–2019, Sustainable Projects Exhibit, Construction Manager as Constructor Edition, into this Agreement to define the terms, conditions and services related to the Owner's Sustainable Objective. If E234–2019 is incorporated into this agreement, the Owner and Construction Manager shall incorporate the completed E234–2019 into the agreements with the consultants and contractors performing services or Work in any way associated with the Sustainable Objective.

§ 1.1.7 Other Project information:
(Identify special characteristics or needs of the Project not provided elsewhere.)

None

§ 1.1.8 The Owner identifies the following representative in accordance with Section 4.2:
(List name, address, and other contact information.)

David Johnson, Owner's Representative
Johnson Johnson Crabtree Architects P.C.
4551 Trousdale Drive
Nashville, TN 37204

§ 1.1.9 The persons or entities, in addition to the Owner's ~~representative~~, Representative, who are required to review the Construction Manager's submittals to the Owner are as follows:
(List name, address and other contact information.)

As determined as start of construction

Init.

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User Notes:

(1916883821)

§ 1.1.10 The Owner shall retain the following consultants and contractors:
(List name, legal status, address, and other contact information.)

.1 Geotechnical Engineer:

TTL
624 Grassmere Park, Suite 14
Nashville, TN 37211

.2 Civil Engineer:

Align Civil Engineering Consultants
525 W. Honey Creek Drive
Terre Haute, IN 47802

.3 Other, if any:

(List any other consultants retained by the Owner, such as a Project or Program Manager.)

Owner's Representative

David E. Johnson
Johnson Johnson Crabtree Architects P.C.
4551 Trousdale Drive
Nashville, TN 37204

§ 1.1.11 The Architect's representative:
(List name, address, and other contact information.)

Stephanie Pielich
Johnson Johnson Crabtree Architects P.C.
4551 Trousdale Drive
Nashville, TN 37215

§ 1.1.12 The Construction Manager identifies the following representative in accordance with Article 3:
(List name, address, and other contact information.)

TBD

§ 1.1.13 The Owner's requirements for the Construction Manager's staffing plan for Preconstruction Services, as required under Section 3.1.9:
(List any Owner-specific requirements to be included in the staffing plan.)

None

§ 1.1.14 The Owner's requirements for subcontractor procurement for the performance of the Work:

Init.

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User Notes:

(1916883821)

(List any Owner-specific requirements for subcontractor procurement.)

Additionally, Subcontractors and vendors shall be selected using a best value RFP process. The Owner shall participate in determining best value. Upon request by Owner, Construction Manager shall obtain proposals for work contemplated to be self-performed by Construction Manager. In such situations, Owner reserves the right to evaluate all proposals to determine overall best value.

§ 1.1.15 Other Initial Information on which this Agreement is based:

None

§ 1.2 The Owner and Construction Manager may rely on the Initial Information. Both parties, however, recognize that such information may materially change and, in that event, the Owner and the Construction Manager shall appropriately adjust the Project schedule, the Construction Manager's services, and the Construction Manager's compensation. The Owner shall adjust the Owner's budget for the Guaranteed Maximum Price and the Owner's anticipated design and construction milestones, as necessary, to accommodate material changes in the Initial Information.

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

ARTICLE 2 GENERAL PROVISIONS

§ 2.1 The Contract Documents

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract and are as fully a part of the Contract as if attached to this Agreement or repeated herein. Upon the Owner's acceptance of the Construction Manager's Guaranteed Maximum Price proposal, the Contract Documents will also include the documents described in Section 3.2.3 and identified in the Guaranteed Maximum Price Amendment and revisions prepared by the Architect and furnished by the Owner as described in Section 3.2.8. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. If anything in the other Contract Documents, other than a Modification, is inconsistent with this Agreement, this Agreement shall govern. An enumeration of the Contract Documents, other than a Modification, appears in Article 15.

§ 2.2 Relationship of the Parties

The Construction Manager accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and the Owner's Representative as defined in Section 4.2 and exercise the Construction Manager's skill and judgment in furthering the interests of the Owner to furnish efficient construction administration, management services, 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 or approve, in a timely manner, information required by the Construction Manager and to make payments to the Construction Manager in accordance with the requirements of the Contract Documents.

§ 2.2.1 Construction Manager's Representations and Qualifications

§ 2.2.1.1 As an inducement to Owner to enter into the Agreement, Construction Manager represents and warrants the accuracy of any and all statements contained in Construction Manager's proposal and response to the Request for Proposal and any other materials submitted to the Owner, which representations and warranties shall survive the execution of the Contract Documents and Final Completion of the Work and Final Payment therefor.

§ 2.2.1.2 Construction Manager is financially solvent, able to pay its debts as they mature, and possessed of sufficient working capital to complete the Work and perform its obligations under the Contract Documents in an efficient and capable manner;

§ 2.2.1.3 Construction Manager is able to furnish the tools, materials, supplies, equipment, and labor required to complete the Work and perform its obligations under the Contract Documents, and has sufficient experience and competence to do so;

§ 2.2.1.4 Construction Manager is authorized to do business in the state where the Project is located and is properly licensed by all necessary governmental, public and other authorities having jurisdiction over Construction Manager and the Project;

§ 2.2.1.5 The person(s) executing the Agreement is properly authorized to do so;

§ 2.2.1.6 Construction Manager has visited the Project and become familiar with the Contract Documents and the conditions at the site; has correlated the Contract Documents with the observable, above ground site conditions, and with applicable codes, ordinances, regulation, laws, and decrees and knows of no reason why the Work cannot be performed as shown on the Contract Documents, unless previously stated otherwise in writing by Owner and Architect.

§ 2.2.1.7 The Work to be performed on this Project shall conform to good and sound construction practices, to the requirements of the warranties applicable to the Work and to the requirements of the Contract Documents.

§ 2.3 General Conditions

§ 2.3.1 For the Preconstruction Phase, AIA Document A201™–2017, General Conditions of the Contract for Construction, shall apply as follows: Section 1.5, Ownership and Use of Documents; Section 1.7, Digital Data Use and Transmission; Section 1.8, Building Information Model Use and Reliance; Section 2.2.4, Confidential Information; Section 3.12.10, Professional Services; Section 10.3, Hazardous Materials; Section 13.1, Governing Law. The term "Contractor" as used in A201–2017 shall mean the Construction Manager.

§ 2.3.2 For the Construction Phase, the general conditions of the contract shall be as set forth in A201–2017, which document is incorporated herein by reference. The term "Contractor" as used in A201–2017 shall mean the Construction Manager.

ARTICLE 3 CONSTRUCTION MANAGER'S RESPONSIBILITIES

The Construction Manager's Preconstruction Phase responsibilities are set forth in Sections 3.1 and 3.2, and in the applicable provisions of A201-2017 as amended referenced in Section 2.3.1. The Construction Manager's Construction Phase responsibilities are set forth in Section 3.3. The Owner and Construction Manager may agree, in consultation with the Architect, for the Construction Phase to commence prior to completion of the Preconstruction Phase, in which case, both phases will proceed concurrently. The Construction Manager shall identify a representative authorized to act on behalf of the Construction Manager with respect to the Project.

§ 3.1 Preconstruction Phase

§ 3.1.1 Extent of Responsibility

The Construction Manager shall exercise reasonable care in performing its Preconstruction Services. The Owner and Architect shall be entitled to rely on, and shall not be responsible for, the accuracy, completeness, and timeliness of services and information furnished by the Construction Manager. The Construction Manager, however, does not warrant or guarantee estimates and schedules except as may be included as part of the Guaranteed Maximum Price. The Construction Manager is not required to ascertain that the Drawings and Specifications are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Construction Manager shall promptly report to the Architect and Owner any nonconformity discovered by or made known to the Construction Manager as a request for information in such form as the Architect may require.

§ 3.1.2 The Construction Manager shall provide a preliminary evaluation of the Owner's program, schedule and construction budget requirements, each in terms of the other.

§ 3.1.3 Consultation

§ 3.1.3.1 The Construction Manager shall schedule (in reasonable collaboration with Owner and Architect) and conduct meetings with the Architect and Owner to discuss such matters as procedures, progress, coordination, and scheduling of the Work.

§ 3.1.3.2 The Construction Manager shall advise the Owner and Architect on proposed site use and improvements, selection of materials, building systems, and equipment systems equipment, and general sustainability issues. The Construction Manager shall also provide recommendations to the Owner and Architect, consistent with the Project requirements, on constructability; availability of materials and labor; time requirements for procurement, installation and

construction; prefabrication; and factors related to construction cost including, but not limited to, costs of alternative designs or materials, preliminary budgets, life-cycle data, and possible cost reductions. The Construction Manager shall consult with the Architect regarding professional services to be provided by the Construction Manager during the Construction Phase.

§ 3.1.3.3 The Construction Manager shall assist the Owner and Architect in establishing building information modeling and digital data protocols for the Project, using 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.

§ 3.1.3.4 Construction Manager shall actively participate as an engaged member of the project team to advise on design concepts and schedules including reviewing in-progress design documents and providing advice and recommendations with respect to completeness, clarity, construction feasibility, alternative materials/methods and long-lead material procurements. Construction Manager shall assist the Architect in the development of the design documents required to be prepared by the Architect pursuant to the Agreement between the Architect and the Owner ("Design Documents") for the Project by making recommendations and providing advice directly to the Architect, but shall not provide professional services which constitute the practice of architecture or engineering. All recommendations and advice of Construction Manager or any specialty subcontractors concerning the Design Documents including without limitation any proposed modifications or alternatives, shall be subject to the review and approval of the Architect in consultation with the Owner. The Architect shall have final decision authority on whether to include or incorporate any such recommendations and advice into the Design Documents.

§ 3.1.3.5 Construction Manager shall provide information on construction materials, methods, systems, phasing and costs to assist in determinations aimed at providing Owner with the highest quality facility, consistent with the budget, schedule, design intent and program requirements.

§ 3.1.3.6 Construction Manager shall recommend strategies for the division of work to facilitate bidding and award of trade contracts, considering such factors as the sequence of construction, funding availability, improving or accelerating construction completion, and other related issues.

§ 3.1.3.7 Construction Manager with Architect's agreement shall establish procedures for the preparation of all shop drawings, submittals, requests for information and related documents prepared by or for the Construction Manager, and expediting the Architect's and Owner's review of same.

§ 3.1.4 Project Schedule

~~When Project requirements in Section 4.1.1 have been sufficiently identified, Upon execution of this Agreement based on available information, the Construction Manager shall prepare and periodically update update monthly or as requested by the Owner a Project schedule for the Architect's review and the Owner's acceptance. The Construction Manager shall obtain the Architect's approval for the portion of the Project schedule relating to the performance of the Architect's services. The Project schedule shall coordinate and integrate the Construction Manager's services, the Architect's services, the Architect's Consultants' services, other Owner consultants' services, and the Owner's responsibilities; and identify items that affect the Project's timely completion. The updated Project schedule shall include the following: submission of the Guaranteed Maximum Price proposal; components of the Work; times of commencement and completion required of each Subcontractor; ordering and delivery of products, including those that must be ordered in advance of construction; and the occupancy requirements of the Owner.~~

§ 3.1.4.1 The schedule and its format shall be mutually agreed to by the Owner, Architect and Construction Manager and shall contain the information required in Section 3.10 of the A201-2017 as amended. The schedule shall be maintained by the Construction Manager at the Project site to reflect current conditions; and the Construction Manager shall provide copies to the Owner and Architect with monthly reports as to the current status of and deviations from the schedule, the causes of the deviations, and the corrective actions that has been or is to be taken. The Construction Manager shall comply with the schedule.

§ 3.1.5 Phased Construction

The Construction Manager, in consultation with the Architect, shall provide recommendations with regard to accelerated or fast-track scheduling, procurement, and sequencing for phased construction. The Construction Manager shall take into consideration cost reductions, cost information, constructability, provisions for temporary facilities, and procurement and construction scheduling issues. **SEE EXHIBIT H-USA Attachment 5 to AIA Document A133-2019 for revisions.**

Init.

§ 3.1.6 Cost Estimates

§ 3.1.6.1 Based on the preliminary design and other design criteria prepared by the Architect, the Construction Manager shall prepare, for the Architect's review and the Owner's approval, preliminary estimates of the Cost of the Work or the cost of program requirements using area, volume, or similar conceptual estimating techniques. If the Architect or Construction Manager suggests alternative materials and systems, the Construction Manager shall provide cost evaluations of those alternative materials and systems.

§ 3.1.6.2 As the Architect progresses with the preparation of the Schematic Design, Design Development and Construction Documents, the Construction Manager shall prepare and update, at appropriate intervals agreed to by the Owner, Construction Manager and Architect, an estimate of the Cost of the Work with increasing detail and refinement. The Construction Manager shall include in the estimate those costs to allow for the further development of the design, price escalation, and market conditions, until such time as the Owner and Construction Manager agree on a Guaranteed Maximum Price for the Work. The estimate shall be provided for the Architect's ~~review and Owner's review~~, and the Owner's approval. The Construction Manager shall inform the Owner and Architect in the event that the estimate of the Cost of the Work exceeds the latest approved Project budget, and make recommendations for corrective action. The Construction Manager shall prepare and submit to the Owner a cash flow estimate indicating the anticipated schedule of payment application amounts with each iteration of the cost estimates and updated preliminary schedule. The cash flow estimate shall be revised periodically to reflect actual job conditions or as requested by the Owner.

~~§ 3.1.6.3 If the Architect is providing cost estimating services as a Supplemental Service, and a discrepancy exists between the Construction Manager's cost estimates and the Architect's cost estimates, the Construction Manager and the Architect shall work together to reconcile the cost estimates.~~

§ 3.1.7 As the Architect progresses with the preparation of the Schematic Design, Design Development and Construction Documents, the Construction Manager shall consult with the Owner and Architect and make recommendations regarding constructability and schedules, for the Architect's review and the Owner's approval.

§ 3.1.8 The Construction Manager shall provide recommendations and information to the Owner and Architect regarding equipment, materials, services, and temporary Project facilities.

§ 3.1.9 The Construction Manager shall provide a staffing plan for Preconstruction Phase services for the Owner's review and approval.

~~§ 3.1.10 If the Owner identified a Sustainable Objective in Article 1, the Construction Manager shall fulfill its Preconstruction Phase responsibilities as required in AIA Document E234™ 2019, Sustainable Projects Exhibit, Construction Manager as Constructor Edition, attached to this Agreement.~~

§ 3.1.11 Subcontractors and Suppliers

~~§ 3.1.11.1 If the Owner has provided requirements for subcontractor procurement in section 1.1.14, the Construction Manager shall provide a subcontracting plan, addressing the Owner's requirements, for the Owner's review and approval.~~

§ 3.1.11.2 The Construction Manager shall develop bidders' interest in the Project. The Construction Manager shall prepare a list of interest bidders for the Project for the Owner's approval. A minimum of three bids shall be obtained for each trade, unless the Owner agrees otherwise.

§ 3.1.11.3 The processes described in Article 9 shall apply if bid packages will be issued during the Preconstruction Phase.

§ 3.1.12 Procurement

The Construction Manager shall prepare, for the Architect's review and the Owner's acceptance, a procurement schedule for items that must be ordered in advance of construction. The Construction Manager shall expedite and coordinate the ordering and delivery of materials that must be ordered in advance of construction. If the Owner agrees to procure any items prior to the establishment of the Guaranteed Maximum Price, the Owner shall procure the items on terms and conditions acceptable to the Construction Manager. Upon the establishment of the Guaranteed Maximum Price, the Owner shall assign all contracts for these items to the Construction Manager and the Construction Manager shall thereafter accept responsibility for them.

§ 3.1.13 Compliance with Laws

The Construction Manager shall comply with applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to its performance under this Contract, and with equal employment opportunity programs, and other programs as may be required by governmental and quasi-governmental authorities.

§ 3.1.14 Other Preconstruction Services

Insert a description of any other Preconstruction Phase services to be provided by the Construction Manager, or reference an exhibit attached to this document

(Describe any other Preconstruction Phase services, such as providing cash flow projections, development of a project information management system, early selection or procurement of subcontractors, etc.)

N/A

§ 3.2 Guaranteed Maximum Price Proposal

§ 3.2.1 At a time to be mutually agreed upon by the Owner and the Construction Manager, the Construction Manager shall prepare a Guaranteed Maximum Price proposal for the Owner's and Architect's review, and the Owner's acceptance. The Guaranteed Maximum Price in the proposal shall be the sum of the Construction Manager's estimate of the Cost of the Work, the Construction Manager's contingency described in Section 3.2.4, and the Construction Manager's Fee described in Section 6.1.2.

§ 3.2.2 To the extent that the Contract Documents are anticipated to require further ~~development~~, development or interpretation, the Guaranteed Maximum Price includes the costs attributable to such further development or interpretation 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~~, or equipment or concealed conditions which could not reasonably be foreseen, all of which, if required, shall be incorporated by Change Order.

§ 3.2.3 The Construction Manager shall include with the Guaranteed Maximum Price proposal a written statement of its basis, which shall include the following:

- .1 A list of the Drawings and Specifications, including all Addenda thereto, and the Conditions of the Contract;
- .2 A list of the clarifications and assumptions made by the Construction Manager in the preparation of the Guaranteed Maximum Price proposal, including assumptions under Section 3.2.2;
- .3 A statement of the proposed Guaranteed Maximum Price, including a statement of the estimated Cost of the Work organized by trade categories or systems, including allowances; the Construction Manager's contingency set forth in Section 3.2.4; and the Construction Manager's ~~Fees~~ Fee including the impact of proposed phasing, schedule and site utilization plan;
- .4 The anticipated date of Substantial Completion upon which the proposed Guaranteed Maximum Price is based; and
- .5 A date by which the Owner must accept ~~the Guaranteed Maximum Price~~ the Guaranteed Maximum Price, which shall be at least 60 days after the delivery of the Guaranteed Maximum Price proposal to the Owner

§ 3.2.4 In preparing the Construction Manager's Guaranteed Maximum Price proposal, the Construction Manager shall include ~~a contingency for the Construction Manager's exclusive use to cover those costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order~~ Construction Contingency for the Construction Manager's use with the Owner's written approval. The Construction Contingency is a sum established by the Construction Manager with the Owner's approval to cover costs arising under Section 3.2.2 and other costs which are properly reimbursable as Cost of the Work but not the basis for a Change Order and in compliance with Section 7.5 of AIA Document A201-2017, General Conditions of the Contract for Construction, as modified by the parties. On no less than a monthly basis, Construction Manager shall prepare and submit to the Owner a Construction Contingency Consumption Report showing all of the charges, including both the amounts and reasons that have been applied to the Construction Contingency. The Owner shall notify the Construction Manager of any objections of the Report within five days of receipt of the Report.

§ 3.2.5 The Construction Manager shall meet with the Owner and Architect to review the Guaranteed Maximum Price proposal. In the event that the Owner or Architect discover any inconsistencies or inaccuracies in the information presented, they shall promptly notify the Construction Manager, who shall make appropriate adjustments to the Guaranteed Maximum Price proposal, its basis, or both. The time for Owner's acceptance of the Construction Manager's

Guaranteed Maximum Price proposal shall be tolled up to an additional 30 days (for a total open period of 60 days) during the interval from the Owner's notice of inconsistencies or inaccuracies and the Construction Manager's re-delivery of the adjusted Guaranteed Maximum Price proposal.

§ 3.2.6 If the Owner notifies the Construction Manager that the Owner has accepted the Guaranteed Maximum Price proposal in writing before the date specified in the Guaranteed Maximum Price proposal, the Guaranteed Maximum Price proposal shall be deemed effective without further acceptance from the Construction Manager. Following acceptance of a Guaranteed Maximum Price, the Owner and Construction Manager shall execute the Guaranteed Maximum Price Amendment amending this Agreement, a copy of which the Owner shall provide to the Architect. The Guaranteed Maximum Price Amendment shall set forth the agreed upon Guaranteed Maximum Price with the information and assumptions upon which it is based.

§ 3.2.6.1 The Owner shall have a minimum of 60 days to accept any Guaranteed Maximum Price in coordination with USDA financing approval process.

§ 3.2.6.2 In the event the Owner and Construction Manager fail to timely execute a GMP Amendment, the Owner reserves the right to negotiate and contract for the construction of the Project with another contractor or take other action as it deems appropriate. In the event the Owner elects to contract the Construction Phase Work with an alternate contractor, the Construction Manager shall not be entitled to any lost profits, consequential damages or other damages, but shall be entitled only payment for Pre-Construction Phase services under section 3.1 satisfactorily performed under this Agreement. This section 3.2.6.2 does not preclude the Owner from terminating this Agreement pursuant to the terms of this Agreement.

§ 3.2.7 The Construction Manager shall not incur any cost to be reimbursed as part of the Cost of the Work prior to the execution of the Guaranteed Maximum Price Amendment, unless the Owner provides prior written authorization for such costs.

§ 3.2.8 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions and clarifications contained in the Guaranteed Maximum Price Amendment. The Owner shall promptly furnish such revised Contract Documents to the Construction Manager. The Construction Manager shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions and clarifications contained in the Guaranteed Maximum Price Amendment and the revised Contract Documents.

§ 3.2.9 The Construction Manager shall include in the Guaranteed Maximum Price all sales, consumer, use and similar taxes for the Work provided by the Construction Manager that are legally enacted, whether or not yet effective, at the time the Guaranteed Maximum Price Amendment is executed.

§ 3.3 Construction Phase

§ 3.3.1 General

§ 3.3.1.1 For purposes of Section 8.1.2 of A201–2017, the date of commencement of the Work shall mean the date of commencement of the Construction Phase.

§ 3.3.1.2 The Construction Phase shall commence upon the Owner's execution of the Guaranteed Maximum Price Amendment or, prior to acceptance of the Guaranteed Maximum Price proposal, by written agreement of the parties. The written agreement shall set forth a description of the Work to be performed by the Construction Manager, and any insurance and bond requirements for Work performed prior to execution of the Guaranteed Maximum Price Amendment.

§ 3.3.2 Administration

§ 3.3.2.1 The Construction Manager shall schedule and conduct meetings at least monthly to discuss such matters as procedures, progress, coordination, scheduling, (both overall and look ahead), and status of the Work, Commissioning and pay applications. Up to date logs related to submittals, RFI's, change orders, and quality control issues shall be presented at each meeting. During active construction, such meetings shall include a site walk-through and inspection on the progress, quantity and quality of the Work. The Construction Manager shall prepare and promptly distribute minutes of the meetings to the Owner and Architect. draft minutes of the meetings for the Owner's and Architect's review. Final corrected minutes shall be promptly distributed to Owner and Architect. Construction Manager shall also promptly distribute all other relevant/updated information to the Owner and Architect, including but not limited to submittals,

RFI's, daily logs, CPM schedule updates, pay applications, reports, test and inspection results, etc. SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.

§ 3.3.2.2 Upon the execution of the Guaranteed Maximum Price Amendment, the Construction Manager shall ~~prepare and submit to the Owner and Architect a update the~~ construction schedule for the Work and a submittal schedule in accordance with Section 3.10 of A201-2017 of A201-2017 including the Owner's occupancy requirements and other information outline in Section 3.1.4 of this Agreement.

§ 3.3.2.3 Monthly Report

The Construction Manager shall record the progress of the Project. On a ~~monthly~~ weekly basis, or otherwise as agreed to by the Owner, the Construction Manager shall submit written progress reports to the Owner and Architect, showing percentages of ~~completion~~ completion, consumption and status of Construction Contingency and other information required by the ~~Owner~~ Owner including Work anticipated in following weeks by week for four week, utility shutdowns and/or work outside construction zone, and major deliveries scheduled.

§ 3.3.2.4 Daily Logs

The Construction Manager shall keep, and make available to the Owner and Architect, a daily log containing a record for each day of weather, portions of the Work in progress, number of workers on site, identification of equipment on site, problems that might affect progress of the work, accidents, injuries, and other information required by the Owner.

§ 3.3.2.5 Cost Control

The Construction Manager shall develop a system of cost control for the Work, including regular monitoring of actual costs for activities in progress and estimates for uncompleted tasks and proposed changes. The Construction Manager shall identify variances between actual and estimated costs and report the variances to the Owner and Architect, and shall provide this information in its monthly reports to the Owner and Architect, in accordance with Section 3.3.2.3 above.

§ 3.3.2.10 The Construction Manager shall establish sufficient, competent and qualified on-site organization, staffing and support as well as clear lines of authority in order to expeditiously complete the Project in accordance with the Contract Documents, in every aspect, on a totally coordinated basis. The Construction Manager shall maintain a competent full-time staff at the site to supervise, schedule and coordinate the Work of all Subcontractors in accordance with the Owner's objectives including cost, time for completion and quality of the Work. The project staff shall comprise the individuals identified in the Construction Manager's Staffing Plan included in Exhibit B. No members of the key staff on the Staffing Plan shall be changed without the prior written consent of the Owner.

§ 3.3.2.11 The Construction Manager shall supervise and direct the Work using the Construction Manager's best skill and attention. The Construction Manager 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 Documents or that which is reasonably inferable for the completion of the Project.

§ 3.3.2.12 The Construction Manager shall provide and maintain a correct layout of the structures and monitor the Work to verify that the Subcontractors adhere to all lines and levels. The Construction Manager shall immediately report in writing to the Owner and the Architect all discrepancies with respect to design details for prompt disposition by the Architect in consultation with the Owner.

§ 3.3.2.13 The Construction Manager shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities of the Owner, the Architect, or by tests, inspections or approvals required or performed by persons other than the Construction Manager, except where such relief is authorized by the Owner in writing in accordance with the Contract Documents.

§ 3.3.2.14 The Construction Manager shall be responsible to the Owner for acts and omissions of the Construction Manager's employees, Subcontractors and their agents and employees, and other persons performing any portion of the Work.

§ 3.3.2.15 The Construction Manager shall be responsible for inspection of portions of Work performed or portions of existing facilities being renovated in this Project to determine that such portions are in proper condition to receive subsequent Work. Further, the Construction Manager shall plan for and call for the review of the Work by the Owner's commissioning agents as required. The Project Schedule shall include activities and durations that recognize this coordination responsibility.

§ 3.3.2.16 The Construction Manager shall inspect the Work of the Subcontractors on the Project, while the Work is being performed through final completion and acceptance of the Project by the Owner to assure that the Work performed and the materials furnished are in strict accordance with the Drawings and Specifications; the Construction Manager shall also inspect the Work to verify that Work on the Project is progressing on schedule.

§ 3.3.2.17 Permits, Tests and Inspections

The Construction Manager shall coordinate and secure all permits required to construct the Project. The Construction Manager shall also coordinate and schedule all code required and other inspections and tests required by the Contract Documents, and inform the Owner and Architect in a timely manner so they have a reasonable opportunity to observe all inspections and tests.

§ 3.3.2.18 The Construction Manager shall designate in writing a representative who shall have the express authority to bind the Construction Manager with respect to all matters requiring the Construction Manager's approval and authorization. This representative shall have the authority to make decisions on behalf of the Construction Manager concerning estimates and schedules, construction budgets, and changes in the Work, and shall render such decisions promptly and furnish information expeditiously, so as to avoid unreasonable delay in the performance of the Work. Key Personnel shall remain the same during the Preconstruction and Construction Phases and shall not be replaced on the Project without the Owner's written consent, which shall not be unreasonably withheld

ARTICLE 4 OWNER'S RESPONSIBILITIES

§ 4.1 Information and Services Required of the Owner

§ 4.1.1 The ~~Owner~~ Owner, upon reasonable request of the Construction Manager, shall provide information with reasonable promptness, regarding requirements for and limitations on the Project, including a written program which shall set forth the Owner's objectives, constraints, and criteria, including schedule, space requirements and relationships, flexibility and expandability, special equipment, systems, sustainability and site requirements.

§ 4.1.2 ~~Prior to the execution of the Guaranteed Maximum Price Amendment, the Construction Manager may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. After execution of the Guaranteed Maximum Price Amendment, the Construction Manager may request such information as set forth in A201-2017 Section 2.2.~~ Construction Manager may only request evidence of the Owner's financial arrangements to fulfill its obligations under the Contract if (1) the Owner fails to make payments to the Construction Manager as the Contract Documents require, (2) a change in the Work materially changes the Contract Sum, or (3) the Construction Manager identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence promptly. After the Owner furnishes the evidence, the Owner shall provide notice to Construction Manager of any material variance in such financial arrangements.

§ 4.1.3 The Owner shall establish and periodically update the Owner's budget for the Project, including (1) the budget for the Cost of the Work as defined in Article 7, (2) the Owner's other costs, and (3) reasonable contingencies related to all of these costs. If the Owner significantly increases or decreases the Owner's budget for the Cost of the Work, the Owner shall notify the Construction Manager and Architect. The Owner and the Architect, in consultation with the Construction Manager, shall thereafter agree to a corresponding change in the Project's scope and quality.

§ 4.1.4 Structural and Environmental Tests, Surveys and Reports. During the Preconstruction Phase, at the Construction Manager's reasonable request, the Owner shall furnish the following information or services with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Construction Manager's performance of the Work with reasonable promptness after receiving the Construction Manager's written request for such information or services. The Construction Manager shall be entitled to reasonably rely on the accuracy of information and services furnished by the Owner but shall exercise reasonable care in verifying the information provided and exercise proper precautions relating to the safe performance of the Work.

§ 4.1.4.1 The Owner shall furnish tests, inspections, and reports, required by law and as otherwise agreed to by the parties, such as structural, mechanical, and chemical tests, tests for air and water pollution, and tests for hazardous materials.

§ 4.1.4.2 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a written legal description of the site. The surveys and legal information shall include, as applicable, grades and lines of streets, alleys, pavements and adjoining property and structures; designated wetlands;

adjacent drainage; rights-of-way, restrictions, easements, encroachments, zoning, deed restrictions, boundaries and contours of the site; locations, dimensions and other necessary data with respect to existing buildings, other improvements and trees; and information concerning available utility services and lines, both public and private, above and below grade, including inverts and depths. All the information on the survey shall be referenced to a Project benchmark.

§ 4.1.4.3 The Owner, when such services are ~~requested~~, requested and agreed to by the Owner, shall furnish services of geotechnical engineers, which may include test borings, test pits, determinations of soil bearing values, percolation tests, evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations. Such services will be requested by the Construction Manager at the time of submission of the GMP.

§ 4.1.5 During the Construction Phase, the Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Construction Manager's performance of the ~~Work-Work~~, as mutually agreed between the Construction Manager and Owner, with reasonable promptness after receiving the Construction Manager's written request for such information or services.

§ 4.1.6 The Construction Manager shall exercise reasonable care to determine the sufficiency and accuracy of the information and shall immediately notify the Owner in the event that a discrepancy or inaccuracy in the information is identified. In the event that the discrepancy or inaccuracy results in additional cost to the Construction Manager, the Owner may in the exercise of its sole discretion make an adjustment to the Guaranteed Maximum Price.

§ 4.1.6 ~~If the Owner identified a Sustainable Objective in Article 1, the Owner shall fulfill its responsibilities as required in AIA Document E234™ 2019, Sustainable Projects Exhibit, Construction Manager as Constructor Edition, attached to this Agreement.~~

§ 4.2 Owner's Designated Representative (Owner's Representative)

~~The Owner shall identify a representative authorized to act on behalf of the Owner with respect to the Project. Owner's Representative identified in Section 1.1.8 is authorized to act on the Owner's behalf on issues directly related to the Project. Except as otherwise provided in Section 4.2.1 of the General Conditions, the Architect does not have such authority. References to the Owner in this Agreement, with respect to the submittal of documents, reviews, inspections, meeting attendance, etc. shall mean both personnel with Project responsibilities employed directly by the Owner, and Owner's Representative identified in Section 1.1.8. However, when this Agreement stipulates "Owner approval", such approvals are reserved for and shall only be made by authorized individuals who work directly for the Owner, unless specifically stated otherwise in this Agreement or otherwise delegated in writing to the Representative identified in Section 1.1.8. The Owner's representative shall render decisions promptly and furnish information expeditiously, so as to avoid unreasonable delay in the services or Work of the Construction Manager. Except as otherwise provided in Section 4.2.1 of A201-2017, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative and sequential progress of the Work. The Owner shall not be responsible for any acts or omissions of such representative that are outside of the scope of that representative's express authority.~~

§ 4.2.1 Legal Requirements. The Owner shall furnish all legal, insurance and accounting services, including auditing services, that may be reasonably necessary at any time for the Project to meet the Owner's needs and interests.

§ 4.3 Architect

~~The Owner shall retain an Architect to provide basic services, duties and responsibilities as described in AIA Document B133™ 2019, B101-2017, Standard Form of Agreement Between Owner and Architect, Construction Manager as Constructor Edition, including any additional services requested by the Construction Manager that are necessary for the Preconstruction and Construction Phase services under this Agreement. The Owner shall provide the Construction Manager with a copy of the scope of services in the executed agreement between the Owner and the Architect, and any further modifications to the Architect's scope of services in the agreement.~~

ARTICLE 5 COMPENSATION AND PAYMENTS FOR PRECONSTRUCTION PHASE SERVICES

§ 5.1 Compensation

§ 5.1.1 For the Construction Manager's Preconstruction Phase services described in Sections 3.1 and 3.2, including subcontractor personnel, the Owner shall compensate the Construction Manager as follows:

(Insert amount of, or basis for, compensation and include a list of reimbursable cost items, as applicable.)

Init.

TBD

§ 5.1.2 The hourly billing rates for Preconstruction Phase services of the Construction Manager and the Construction Manager's Consultants and Subcontractors, if any, are set forth below.
(If applicable, attach an exhibit of hourly billing rates or insert them below.)

Contractor's Standard Hourly Billing Rates

Individual or Position
TBD

Rate

§ 5.1.2.1 Hourly billing rates for Preconstruction Phase services include all costs to be paid or incurred by the Construction Manager, as required by law or collective bargaining agreements, for taxes, insurance, contributions, assessments and benefits and, for personnel not covered by collective bargaining agreements, customary benefits such as sick leave, medical and health benefits, holidays, vacations and pensions, and shall remain unchanged unless the parties execute a Modification.

§ 5.1.3 If the Preconstruction Phase services covered by this Agreement have not been completed within eighteen (18) months of the date of this Agreement, through no fault of the Construction Manager, the Construction Manager's compensation for Preconstruction Phase services shall be equitably adjusted.

§ 5.2 Payments

§ 5.2.1 Unless otherwise agreed, payments for services shall be made monthly in proportion to services performed.

§ 5.2.2 Payments are due and payable ~~upon presentation of the Construction Manager's invoice. Amounts unpaid (—) days after the invoice date by the end of the month if such invoices are received by the tenth of the month; otherwise,~~ payments are due thirty (30) days after the tenth of the month following receipt of the invoice. Amounts unpaid after the date on which payment is due shall bear interest at the rate entered below, or in the absence thereof at the legal rate prevailing from time to time at the principal place of business of the Construction Manager.
(Insert rate of monthly or annual interest agreed upon.)

~~%—Prime rate at Owner's bank plus one point.~~

ARTICLE 6 COMPENSATION FOR CONSTRUCTION PHASE SERVICES

§ 6.1 Contract Sum

§ 6.1.1 The Owner shall pay the Construction Manager the Contract Sum in current funds for the Construction Manager's performance of the Contract after execution of the Guaranteed Maximum Price Amendment. The Contract Sum is the Cost of the Work as defined in Article 7 plus the Construction Manager's Fee.

§ 6.1.2 The Construction Manager's Fee:

(State a lump sum, percentage of Cost of the Work or other provision for determining the Construction Manager's Fee.)

TBD

§ 6.1.3 The method of adjustment of the Construction Manager's Fee for changes in the Work:

TBD

§ 6.1.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§6.1.4.1 For the Construction Manager, no increase for overhead and General Conditions as a percentage. Overhead and General Conditions increase for change in the Work shall be reviewed as cost of Work. Changes in Overhead and General Conditions shall not be due or approved unless the Owner approves a material change in the scope of the Work that results in an approved extension in time

§6.1.4.2 The following overhead and profit rates shall be used for subcontractors. This overhead rate includes the cost of General Overhead and fee items defined for the Contractor in the Agreement. No subcontractor cost of office staff or overhead items shall be itemized in a change order request.

Overhead and fee: TBD_subcontractor overhead and TBD profit.
Labor Burden: TBD

§ 6.1.5 Rental rates for Construction Manager-owned equipment shall not exceed percent (—%) of the standard rental rate paid at the place of the Project, actual invoiced amount. . The Construction Manager shall advise the Owner’s Project Team if the anticipated total rental cost for any Construction Manager-owned equipment is likely to exceed the total purchase price of the equipment. If the purchase of such equipment is likely to produce Project cost savings, the Construction Manager shall recommend equipment purchases, with title taken by the Owner or the Construction Manager as appropriate. In no event shall the total rental cost exceed the fair market value of the Construction Manager-owned equipment as identified in the Construction Manager’s accepted proposal, and all rent shall be abated if this limit is reached.

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

See Article 14.6

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

§ 6.1.8 The total aggregate markup that will be used by all first-tier subcontractors in the GMP, to cover profit and home office overhead costs for the first-tier subcontractor and all lower-tier subcontractors that perform work for them shall not exceed ten percent (10%) without prior written consent of the Owner. Maximum markup rates shall be reflected, for each trade category and subcontract, in the approved GMP Amendment.

§ 6.2 Guaranteed Maximum Price

The Construction Manager guarantees that the Contract Sum shall not exceed the Guaranteed Maximum Price set forth in the Guaranteed Maximum Price Amendment, subject to additions and deductions by Change Order as provided in the Contract Documents. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Construction Manager without reimbursement by the Owner.

All savings in the Guaranteed Maximum Price including unused contingencies inure to the sole benefit of the Owner and shall be returned to the Owner by the Construction Manager if previously advanced by deductive change order prior to final payment.

§ 6.2.1 The Construction Manager shall not use any funds from the Construction Manager’s contingency without the prior written approval of the Owner. The Construction Manager shall keep a Contingency Log up to date and review it with the Owner on a monthly basis. If the Owner and Construction Manager disagree on the use of the contingency for any item and the parties are not able to resolve the dispute, the matter will be resolved as provided in Article 15 of AIA Document A201-2017, as amended by the parties.

§ 6.2.1.2 During the review of the Contingency Log, the parties will discuss opportunities to release a portion of the contingency to the Owner for the Owner’s use in connection with the Project before Substantial Completion.

§ 6.3 Changes in the Work

§ 6.3.1 The Owner may, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other ~~revisions~~—revisions as provided in Article 7 of the General Conditions. The Owner shall issue such changes in writing. The Construction Manager may be entitled to an equitable adjustment in the Contract Time as a result of changes in ~~the Work~~—the Work provided that the Construction Manager demonstrates entitlement as required by the Contract Documents.

~~§ 6.3.1.1 The Architect may order minor changes in the Work as provided in Article 7 of AIA Document A201–2017, General Conditions of the Contract for Construction.~~

§ 6.3.2 Adjustments to the Guaranteed Maximum Price on account of changes in the Work subsequent to the execution of the Guaranteed Maximum Price Amendment may be determined by any of the methods listed in Article 7 of AIA Document A201–2017, General Conditions of the Contract for Construction.

§ 6.3.3 Adjustments to subcontracts awarded on the basis of a stipulated sum shall be determined in accordance with Article 7 of A201–2017, as they refer to "cost" and "fee," and not by Articles 6 and 7 of this Agreement. Adjustments to subcontracts awarded with the Owner's prior written consent on the basis of cost plus a fee shall be calculated in accordance with the terms of those subcontracts.

§ 6.3.4 In calculating adjustments to the Guaranteed Maximum Price, the terms "cost" and "costs" as used in Article 7 of AIA Document A201–2017 shall mean the Cost of the Work as defined in Article 7 of this Agreement as well as the exclusions from the Cost of the Work as defined in Section 7.9 and the term "fee" shall mean the Construction Manager's Fee as defined in Section 6.1.2 of this Agreement.

~~§ 6.3.5 If no specific provision is made in Section 6.1.3 for adjustment of the Construction Manager's Fee in the case of changes in the Work, or if the extent of such changes is such, in the aggregate, that application of the adjustment provisions of Section 6.1.3 will cause substantial inequity to the Owner or Construction Manager, the Construction Manager's Fee shall be equitably adjusted on the same basis that was used to establish the Fee for the original Work, and the Guaranteed Maximum Price shall be adjusted accordingly.~~

ARTICLE 7 COST OF THE WORK FOR CONSTRUCTION PHASE

§ 7.1 Costs to Be Reimbursed

§ 7.1.1 The term Cost of the Work shall mean costs necessarily incurred by the Construction Manager in the proper performance of the Work. The Cost of the Work shall include only the items set forth in Sections 7.1 through 7.7.

§ 7.1.2 Where, pursuant to the Contract Documents, any cost is subject to the Owner's prior approval, the Construction Manager shall obtain such approval in writing prior to incurring the cost. The Owner's written approval prior to incurring the cost. The Construction Manager waives any claim for costs not so approved in advance in writing by the Owner.

§ 7.1.3 Costs shall be at rates not higher than the standard rates paid at the place of the Project, except with prior approval of the Owner.

§ 7.2 Labor Costs

§ 7.2.1 Wages or salaries of construction workers directly employed by the Construction Manager to perform the construction of the Work at the site or, with the Owner's prior approval, at off-site workshops.

§ 7.2.2 Wages or salaries of the Construction Manager's supervisory and administrative personnel when stationed at the site and performing Work, with the Owner's prior approval.

~~§ 7.2.2.1 Wages or salaries of the All Construction Manager's supervisory and administrative personnel when performing Work and stationed at a location other than the site, but only for that portion of time required for the Work, and limited to the personnel and activities listed below:~~

~~*(Identify the personnel, type of activity and, if applicable, any agreed upon percentage of time to be devoted to the Work.)*~~

to be included in the Cost of the Work, as defined in Article 7, are specifically listed in the attachment to Exhibit B of this Agreement; except as defined in Exhibit B, these personnel shall be stationed at the jobsite. Any other Construction Manager supervisory and administrative personnel involved with the Project and not identified below shall not be included in the Cost of the Work. Construction Manager shall not replace the supervisory and administrative personnel listed in attachment to Exhibit B without written notice to consultation with and approval by the Owner. The superintendent shall remain on site until final completion of the Project. Construction Manager shall staff the Project with the remaining personnel as soon as practical relative to the position responsibilities, and those personnel shall remain on site until their responsibilities are fulfilled and their departure will not impede the Construction Manager's schedule for accomplishing tasks and coordinating the Project in an efficient manner. For clarification, the Construction Manager's

home office Project Manager as shown in Exhibit B shall be considered a reimbursable cost for the amount of his time attributed to the project at a cost equal to his hourly salary plus labor burden as a part of General Conditions.

§ 7.2.3 Wages and salaries of the Construction Manager's supervisory or administrative personnel engaged at factories, workshops or while traveling, in expediting the production or transportation of materials or equipment required for the Work, but only for that portion of their time required for the ~~Work~~ Work, if approved by the Owner.

§ 7.2.4 Costs paid or incurred by the Construction Manager, as required by law or collective bargaining agreements, for taxes, insurance, contributions, assessments and benefits and, for personnel not covered by collective bargaining agreements, customary benefits such as sick leave, medical and health benefits, holidays, vacations and pensions, provided such costs are based on wages and salaries included in the Cost of the Work under Sections 7.2.1 through 7.2.3. These costs shall be billed at a percentage of labor cost as mutually agreed by Owner and Construction Manager and established in Exhibit B.

§ 7.2.5 If agreed rates for labor costs, in lieu of actual costs, are provided in this Agreement, the rates shall remain unchanged throughout the duration of this Agreement, unless the parties execute a Modification.

§ 7.3 Subcontract Costs

Payments made by the Construction Manager to Subcontractors in accordance with the requirements of the subcontracts and this Agreement.

§ 7.4 Costs of Materials and Equipment Incorporated in the Completed Construction

§ 7.4.1 Costs, including transportation and storage at the site, of materials and equipment incorporated, or to be incorporated, in the completed construction.

§ 7.4.2 Costs of materials described in the preceding Section 7.4.1 in excess of those actually installed to allow for reasonable waste and spoilage. Unused excess materials, if any, shall become the Owner's property at the completion of the Work or, at the Owner's option, shall be sold by the Construction Manager. Any amounts realized from such sales shall be credited to the Owner as a deduction from the Cost of the Work.

§ 7.5 Costs of Other Materials and Equipment, Temporary Facilities and Related Items

§ 7.5.1 Costs of transportation, storage, installation, dismantling, maintenance, and removal of materials, supplies, temporary facilities, machinery, equipment and hand tools not customarily owned by construction workers that are provided by the Construction Manager at the site and fully consumed in the performance of the Work. Costs of materials, supplies, temporary facilities, machinery, equipment, and tools, that are not fully consumed, shall be based on the cost or value of the item at the time it is first used on the Project site less the value of the item when it is no longer used at the Project site. Costs for items not fully consumed by the Construction Manager shall mean fair market value.

§ 7.5.1.1 Small tools shall be treated as a Cost item to the extent and limit provided in Article 6.11.3 of this Agreement and are defined as those tools costing five thousand dollars (\$5,000.00) or less. A record showing the disposition of these tools is to be on file at the Construction Manager's office on the Project site. Ownership of small tools included in the Cost of the Work and not consumed during construction shall remain with the Owner upon completion of the Project.

§ 7.5.2 ~~Rental-Actual rental~~ charges for temporary facilities, machinery, equipment, and hand tools not customarily owned by construction workers that are provided by the Construction Manager at the site, and the costs of transportation, installation, dismantling, minor repairs, and removal of such temporary facilities, machinery, equipment, and hand tools: tools not exceeding actual costs of the rates published in the locale of the Project or of the latest Associated Equipment Distributors (AED nationally advertised rental rates and shall be updated manually. Rates and quantities of equipment owned by the Construction Manager, or a related party as defined in Section 7.8, shall be subject to the Owner's prior ~~approval-written approval~~ but not more than the rate at equipment rental companies in Nashville, TN. The total rental cost of any such equipment may not exceed the purchase price of any comparable item.

§ 7.5.2.1 In lieu of renting certain items of equipment, machinery and tools, valued at more than five hundred dollars (\$500.00) from the Construction Manager or other third parties, the Owner reserves the right to have those items purchased and maintained as a Cost of the Work. A record showing disposition of these items is to be on file at the

Construction Manager's office at the Project site. Ownership of such items not consumed during construction shall remain with the Owner upon completion of the Project.

§ 7.5.3 Costs of removal of debris from the site of the Work and its proper and legal disposal.

§ 7.5.4 Costs of the Construction Manager's site office, including general office equipment and supplies.

§ 7.5.5 Costs of materials and equipment suitably ~~stored~~-stored, secured, bonded and insured off the site at a mutually acceptable location, subject to the Owner's prior approval. No payment shall be made for items stored off site where ownership does not transfer clear and free to the Owner upon payment.

§ 7.6 Miscellaneous Costs

§ 7.6.1 Premiums for that portion of insurance and bonds required by the Contract Documents that can be directly attributed to this Contract.

§ 7.6.1.1 Costs for self-insurance, for either full or partial amounts of the coverages required by the Contract Documents, with the Owner's prior approval. In the event that the Construction Manager self-insures risks associated with the Work, the Construction Manager's costs of insurance for the risk shall be deemed to be the lowest guaranteed cost then available to the Construction Manager under a fully insured program.

§ 7.6.1.2 Costs for insurance through a captive insurer owned or controlled by the Construction Manager, with the Owner's prior approval.

§ 7.6.2 Sales, use, gross receipts, or similar taxes, imposed by a governmental authority, that are related to the Work and for which the Construction Manager is liable.

§ 7.6.3 Fees and assessments for the building permit, and for other permits, licenses, and inspections, for which the Construction Manager is required by the Contract Documents to pay.

§ 7.6.4 Fees of laboratories for tests required by the Contract Documents; except those related to defective or nonconforming Work for which reimbursement is excluded under Article 13 of AIA Document A201–2017 or by other provisions of the Contract Documents, and which do not fall within the scope of Section 7.7.3.

§ 7.6.5 Royalties and license fees paid for the use of a particular design, process, or product, required by the Contract Documents.

§ 7.6.5.1 The cost of defending suits or claims for infringement of patent rights arising from requirements of the Contract Documents, payments made in accordance with legal judgments against the Construction Manager resulting from such suits or claims, and payments of settlements made with the Owner's consent, unless the Construction Manager had reason to believe that the required design, process, or product was an infringement of a copyright or a patent, and the Construction Manager failed to promptly furnish such information to the Architect as required by Article 3 of AIA Document A201–2017. The costs of legal defenses, judgments, and settlements shall not be included in the Cost of the Work used to calculate the Construction Manager's Fee or subject to the Guaranteed Maximum Price. Notwithstanding the foregoing, such costs shall be limited to the amount of insurance proceeds or other indemnification from the Architect actually received by the Owner related to such claims, suits, or judgments.

§ 7.6.6 Costs for communications services, electronic equipment, and reasonably necessary software, directly related to the Work and located at the site, with the Owner's prior approval.

§ 7.6.7 Costs of document reproductions and delivery charges.

§ 7.6.8 Deposits lost for causes other than the Construction Manager's negligence or failure to fulfill a specific responsibility in the Contract Documents.

§ 7.6.9 Legal, mediation and arbitration costs, including attorneys' fees, fees for the reasonable and necessary legal, mediation and arbitration expenses, other than those arising from disputes between the Owner and Construction Manager,

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Manager or any indemnification obligation in favor of the Owner, reasonably incurred by the Construction Manager after the execution of this Agreement in the performance of the Work and with the Owner's prior approval, which shall not be unreasonably withheld. The Owner shall participate in any decisions relative to selection of counsel, strategy, selection of mediators and/or arbitrators and budget. No decision may be made to which the Owner has a reasonable objection. This cost shall be treated as reimbursable only and not subject to any markup.

§ 7.6.10 ~~Expenses~~ Subject to the Owner's prior approval, expenses incurred in accordance with the Construction Manager's standard written personnel policy for relocation and temporary living allowances of the Construction Manager's personnel required for the Work, with the Owner's prior approval.

§ 7.6.11 That portion of the reasonable expenses of the Construction Manager's supervisory or administrative personnel incurred while traveling in discharge of duties connected with the Work.

§ 7.7 Other Costs and Emergencies

§ 7.7.1 Other costs incurred in the performance of the ~~Work,~~ Work only if, and with the Owner's prior approval.

§ 7.7.2 Costs incurred in taking action to prevent threatened damage, injury, or loss, in case of an emergency affecting the safety of persons and property, as provided in Article 10 of AIA Document A201-2017.

§ 7.7.3 Costs of repairing or correcting damaged or nonconforming Work executed by the Construction Manager, Subcontractors, or suppliers, provided that such damaged or nonconforming Work did not violate the standard of care and was not otherwise caused by the negligence of, or failure to fulfill a specific responsibility by, the Construction Manager, or the Construction Manager's subcontractors or suppliers or anyone for whom the Construction Manager is responsible, and only to the extent that the cost of repair or correction is not recovered by the Construction Manager from insurance, sureties, Subcontractors, suppliers, or others.

§ 7.7.4 ~~The costs described in Sections 7.1 through 7.7 shall be included in the Cost of the Work, notwithstanding any provision of AIA Document A201-2017 or other Conditions of the Contract which may require the Construction Manager to pay such costs, unless such costs are excluded by the provisions of Section 7.9.~~

§ 7.8 Related Party Transactions

§ 7.8.1 For purposes of this Section 7.8, the term "related party" shall mean (1) a parent, subsidiary, affiliate, or other entity having common ownership of, or sharing common management with, the Construction Manager; (2) any entity in which any stockholder in, or management employee of, the Construction Manager holds an equity interest in excess of ten percent in the aggregate; (3) any entity which has the right to control the business or affairs of the Construction Manager; or (4) any person, or any member of the immediate family of any person, who has the right to control the business or affairs of the Construction Manager.

§ 7.8.2 If any of the costs to be reimbursed arise from a transaction between the Construction Manager and a related party, the Construction Manager shall notify the Owner of the specific nature of the contemplated transaction, including the identity of the related party and the anticipated cost to be incurred, before any such transaction is consummated or cost incurred. If the Owner, after such notification, authorizes the proposed transaction in writing, then the cost incurred shall be included as a cost to be reimbursed, and the Construction Manager shall procure the Work, equipment, goods, or service, from the related party, as a Subcontractor, according to the terms of Article 9. If the Owner fails to authorize the transaction in writing, the Construction Manager shall procure the Work, equipment, goods, or service from some person or entity other than a related party according to the terms of Article 9.

§ 7.9 Costs Not To Be Reimbursed

§ 7.9.1 The Cost of the Work shall not include the items listed below:

- .1 Salaries and other compensation of the Construction Manager's personnel stationed at the Construction Manager's principal office or offices other than the site ~~office,~~ office or at the Project site unless dedicated 100% to this Project, except as specifically provided in Section 7.2, or as may be provided in Article 14; See Section 7.2 for costs related to Construction Manager's home office project manager.
- .2 Bonuses, profit sharing, incentive compensation, and any other discretionary payments, paid to anyone hired by the Construction Manager or paid to any Subcontractor or vendor, unless the Owner has provided prior approval;
- .3 Expenses of the Construction Manager's principal office and offices other than the site office;

- .4 Overhead and general expenses, except as may be expressly included in Sections 7.1 to 7.7;
- .5 The Construction Manager's capital expenses, including interest on the Construction Manager's capital employed for the Work;
- .6 Except as provided in Section 7.7.3 of this Agreement, costs due to the negligence of, or failure to fulfill a specific responsibility of the Contract by, the Construction Manager, Subcontractors, and suppliers, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable;
- .7 Any cost not specifically and expressly described in Sections 7.1 to 7.7;
- .8 Costs, other than costs included in Change Orders approved by the Owner, that would cause the Guaranteed Maximum Price to be exceeded; and
- .9 Costs for services incurred during the Preconstruction ~~Phase~~ Phase; and
- .10 Costs for correcting non-conforming Work, except as identified in Section 7.7.3.

ARTICLE 8 DISCOUNTS, REBATES, AND REFUNDS

§ 8.1 Cash discounts obtained on payments made by the Construction Manager shall accrue to the Owner if (1) before making the payment, the Construction Manager included the amount to be paid, less such discount, in an Application for Payment and received payment from the Owner, or (2) the Owner has deposited funds with the Construction Manager with which to make payments; otherwise, cash discounts shall accrue to the Construction Manager. Trade discounts, rebates, refunds, and amounts received from sales of surplus materials and equipment shall accrue to the Owner, and the Construction Manager shall make provisions so that they can be obtained.

§ 8.2 Amounts that accrue to the Owner in accordance with the provisions of Section 8.1 shall be credited to the Owner as a deduction from the Cost of the Work.

ARTICLE 9 SUBCONTRACTS AND OTHER AGREEMENTS

§ 9.1 Those portions of the Work that the Construction Manager does not customarily perform with the Construction Manager's own personnel shall be performed under subcontracts or other appropriate agreements with the Construction Manager. Work to be performed with the Construction Manager's own personnel shall be defined in Exhibit E to this Agreement. The Owner may designate specific persons from whom, or entities from which, the Construction Manager shall obtain bids. The Construction Manager shall obtain bids from Subcontractors, and from suppliers of materials or equipment fabricated especially for the Work, who are qualified to perform that portion of the Work in accordance with the requirements of the Contract Documents. The Construction Manager shall deliver such bids to the Architect and Owner with an indication as to which bids the Construction Manager intends to accept. The Owner then has the right to review the Construction Manager's list of proposed subcontractors and suppliers in consultation with the Architect and, subject to Section 9.1.1, to object to any subcontractor or supplier. Any advice of the Architect, or approval or objection by the Owner, shall not relieve the Construction Manager of its responsibility to perform the Work in accordance with the Contract Documents. The Construction Manager shall not be required to contract with anyone to whom the Construction Manager has reasonable objection. For those portions of the Work that the Construction Manager may elect to perform with its own personnel, the Owner may require the Construction Manager to obtain 3 or more additional bids.

§ 9.1.1 When a specific subcontractor or supplier (1) is recommended to the Owner by the Construction Manager; (2) is qualified to perform that portion of the Work; and (3) has submitted a bid that conforms to the requirements of the Contract Documents without reservations or exceptions, but the Owner requires that another bid be accepted, then the Construction Manager ~~may require or~~ Owner may request that a Change Order be issued to adjust the Guaranteed Maximum Price ~~by limited to~~ the difference between the bid of the person or entity recommended to the Owner by the Construction Manager and the amount of the subcontract or other agreement actually signed with the person or entity designated by the Owner.

§ 9.1.2 Prior to award of any subcontracts by the Construction Manager, it shall review all bids and submittals with the Owner and Owner's Representative. The Owner and Construction Manager shall mutually agree upon the subcontractor to be awarded a subcontract. The Construction Manager shall award subcontracts to qualified Subcontractors mutually approved by the Owner for the Work on a lump sum or not to exceed basis.

§ 9.2 Subcontracts or other agreements shall conform to the applicable payment provisions of this Agreement, and shall not be awarded on the basis of cost plus a fee without the Owner's prior written approval. If a subcontract is awarded on ~~the basis of cost plus a fee, a cost-plus fee basis,~~ the Construction Manager shall provide in the subcontract for the Owner to receive the same audit rights with regard to the Subcontractor as the Owner receives with regard to the Construction Manager in Article 10.

§ 9.3 If the Construction Manager recommends a specific bidder that may be considered a "related party" according to Section 7.8, then the Construction Manager shall promptly notify the Owner in writing of such relationship and notify the Owner of the specific nature of the contemplated transaction, according to Section 7.8.2.

§ 9.4 The Construction Manager shall conduct preconstruction conferences with Subcontractors and schedule and conduct regular progress meetings to be attended by all parties in interest to discuss such matters as procedures, progress, job problems, scheduling, changes, and related matters. The Construction Manager shall take, transcribe and promptly distribute to all parties, including the Owner, minutes of such progress meetings with the Subcontractors including coordination meetings, weekly job meetings and monthly management meetings.

ARTICLE 10 ACCOUNTING RECORDS

The Construction Manager shall keep full and detailed records and accounts related to the Cost of the Work, and exercise such controls, as may be necessary for proper financial management under this Contract and to substantiate all costs incurred. The accounting and control systems shall be satisfactory to the Owner. The Owner and the Owner's auditors shall, during regular business hours and upon reasonable notice, be afforded access to, and shall be permitted to audit and copy, the Construction Manager's records and accounts, including complete documentation supporting accounting entries, books, job cost reports, correspondence, instructions, drawings, receipts, subcontracts, Subcontractor's proposals, Subcontractor's invoices, purchase orders, vouchers, memoranda, and other data relating to this Contract. The Construction Manager shall preserve these records for a period of three years after final payment, or for such longer period as may be required by law. § 10.1 Construction Manager's records, which shall include but not be limited to accounting records (hard copy, as well as computer readable data if it can be made available), written policies and procedures; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating work sheets, correspondence; change order files (including documentation covering negotiated settlements); backcharge logs and supporting documentation; general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends; and any other supporting evidence deemed necessary by the owner to substantiate changes related to the Agreement (collectively referred to as "Records") shall be maintained in accordance with Generally Accepted Accounting Principles and open to inspection and subject to audit and/or reproduction by Owner's agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of Cost of the Work, and any invoices, change order, payments or claims submitted by the Construction Manager or any of his payees pursuant to the execution of the contract.

§ 10.2 Such audits may require inspection and copying from time to time and at reasonable times and places of any and all information, materials and data of every kind and character, including without limitation, records, books, papers, documents, subscriptions, recordings, agreements, purchase order, leases, contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may in Owner's judgment have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any Contract Documents. Such records subject to audit shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs, (including overhead allocations) as they may apply to costs associated with this Agreement.

§ 10.3 The Owner or its designee shall be afforded access to all of the Construction Manager's Records, and shall be allowed to interview any of the Construction Manager's employees, pursuant to the provisions of this article throughout the term of this contract and for a period of four (4) years after Final Payment or longer if required by law. To the extent feasible, the Construction Manager's records shall remain confidential, and the Owner's third party auditors will enter into a mutually agreed-upon confidentiality agreement prior to any audits being conducted.

§ 10.4 Construction Manager shall require all subcontractors, insurance agents and material suppliers (payees) to comply with the provisions of this article by insertion of the requirements hereof in a written contract agreement between Construction Manager and payee. Such requirements will also apply to Subcontractors and all lower tier Subcontractors. Construction Manager will cooperate fully and will cause all of Construction Manager's subcontractors (including those entering into lump sum contracts, payees or lower tier Subcontractors) to cooperate fully by furnishing or making available to Owner from time to time whenever requested in an expeditious manner any and all such information, materials and data.

§ 10.5 Owner's agent or its authorized representative shall have access to the Construction Manager's facilities, shall have access to all necessary records; and shall be provided adequate and appropriate work space, in order to conduct audits in compliance with this article.

§ 10.6 Construction Manager agrees that Owner's designee shall have the right to examine the Construction Manager's records (during the contract period and up to four (4) years after Final Payment is made on the contract) to verify the accuracy and appropriateness of the pricing data used to price change proposals or claims. Construction Manager agrees

that if the Owner determines the cost and pricing data submitted (whether approved or not) was inaccurate, incomplete, not current or not in compliance with the terms of the contract regarding pricing of change orders, an appropriate contract price reduction will be made. Such post-approval contract price adjustments will apply to all levels of contractors and/or subcontractors and to all types of change order proposals specifically including lump sum change orders, unit price change orders and cost-plus change orders.

§ 10.7 If an audit, inspection or examination in accordance with this article, discloses overcharges (of any nature) by the Construction Manager to the Owner in excess of one percent (1%) of the total contract billings, the actual cost of the Owner's audit shall be reimbursed to the Owner by the Construction Manager. Any adjustments and/or payments which must be made as a result of any such audit or inspection of the Construction Manager's invoices and/or records shall be made within a reasonable amount of time (not to exceed 90 days) from presentation of Owner's findings to Construction Manager.

ARTICLE 11 PAYMENTS FOR CONSTRUCTION PHASE SERVICES

§ 11.1 Progress Payments

§ 11.1.1 Based upon Applications for Payment submitted simultaneously to the Architect and Owner's Representative by the Construction Manager, and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum, to the Construction Manager, as provided below and elsewhere in the Contract Documents. **SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.**

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

§ 11.1.3 Provided that an Application for Payment is received by the Architect and Owner's Representative not later than the first day of a month and by the Owner's Representative by the tenth (10th) day of a month, the Owner shall make payment of the amount certified to the Construction Manager not later than the thirtieth day of the month. If an Application for Payment is received by the Architect and Owner's Representative after the application date fixed above, payment of the amount certified shall be made by the Owner not later than (—) days after the Architect receives the Application for Payment. thirty (30) days after the tenth (10th) day of the following month. If the application is returned to the Construction Manager for revision, the payment will be made by the Owner not later than thirty days following the tenth (10th) of the month after acceptable submission.

(Federal, state or local laws may require payment within a certain period of time.)

§ 11.1.4 With each Application for Payment, the Construction Manager shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner or Architect to demonstrate that payments already made by the Construction Manager on account of the Cost of the Work equal or exceed progress payments already received by the Construction Manager, plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Construction Manager's Fee. Construction Manager shall submit fully executed Sworn Statements together with partial lien waivers on behalf of itself and such Subcontractors and Sub-subcontractors shall be submitted with all pay requests for Work performed and for which payment has been made.

§ 11.1.5 Each Application for Payment shall be based on the most recent schedule of values submitted by the Construction Manager in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Construction Manager's Fee.

§ 11.1.5.1 The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect or Owner may require. The schedule of values shall be used as a basis for reviewing the Construction Manager's Applications for Payment. Any monthly adjustments to the Schedule of Values shall be reviewed and approved by the Architect and Owner prior to submission of an Application for Payment based on such revision.

§ 11.1.5.2 The allocation of the Guaranteed Maximum Price under this Section 11.1.5 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

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§ 11.1.5.3 When the Construction Manager allocates costs from ~~a the GMP~~ contingency to another line item in the schedule of values, the Construction Manager shall ~~submit supporting documentation to the Architect.~~request approval from, and submit supporting documentation to the Architect and Owner.

§ 11.1.5.4 All Change Orders shall be itemized on the Schedule of Values as they are approved in a method acceptable to the Owner and Architect.

§ 11.1.6 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed, or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Construction Manager on account of that portion of the Work and for which the Construction Manager has made payment or intends to make payment prior to the next Application for Payment, by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 11.1.6.1 The General Conditions/Overhead Costs for the Project as identified in the attachment to Exhibit A, including those costs set forth in Paragraphs 7.2.2, 7.5.1, and 7.5.2 of this Agreement, shall be capped at a cost to be established by an executed Exhibit B to this Agreement. Notwithstanding anything to the contrary appearing herein, it is understood and agreed that the cost cap is based on the aggregate total of all categories of cost as identified in the attachment to Exhibit B, and not by specific category. Should the cost cap be exceeded, with exception for added costs resulting from approved time extensions and/or changes in the Work in accordance with Article 7 of the General/Supplementary Conditions, the additional cost shall be at the expense of the Construction Manager and not included in the Guaranteed Maximum Price. Individual line item amounts listed under each category of cost as identified in the attachment to Exhibit A include all costs associated with that line item to provide the specific service, function, personnel, equipment, supplies, or materials to perform the Work. The Construction Manager shall report costs charged to items as identified in the attachment to Exhibit B on a separate schedule with each monthly application for payment.

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

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

- .1 That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;
- .2 That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in ~~writing~~;
- ~~.3 writing less retainage of ten percent (10%).~~ **.3** That portion of Construction Change Directives that the Architect determines, in the Architect’s professional judgment, to be reasonably justified; and
- .4 The Construction Manager’s ~~Fee, Fee less retainage of ten percent (10%),~~ computed upon the Cost of the Work described in the preceding Sections 11.1.7.1.1 and 11.1.7.1.2 at the rate stated in Section 6.1.2 or, if the Construction Manager’s Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 11.1.7.1.1 and 11.1.7.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Construction Manager does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Construction Manager intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017;
- .5 The shortfall, if any, indicated by the Construction Manager in the documentation required by Section 11.1.4 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner’s auditors in such documentation; and

.6 Retainage withheld pursuant to Section 11.1.8.

§ 11.1.8 Retainage **SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.**

§ 11.1.8.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Ten percent (10.0%)

§ 11.1.8.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

N/A

§ 11.1.8.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 11.1.8.1 is to be modified prior to Substantial Completion of the entire Work, insert provisions for such modification.)

SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.

§ 11.1.8.3 Except as set forth in this Section 11.1.8.3, upon Substantial Completion of the Work, the Construction Manager may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 11.1.8. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

(Insert any other conditions for release of retainage, such as upon completion of the Owner's audit and reconciliation, upon Substantial Completion.)

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

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

§ 11.1.11 The Owner and the Construction Manager shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors, and the percentage of retainage held on Subcontracts, and the Construction Manager shall execute subcontracts in accordance with those agreements. **SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.**

§ 11.1.12 In taking action on the Construction Manager's Applications for Payment the Architect and the Owner shall be entitled to rely on the accuracy and completeness of the information furnished by the Construction Manager, and such action shall not be deemed to be a representation that (1) the Architect has made a detailed examination, audit, or arithmetic verification, of the documentation submitted in accordance with Section 11.1.4 or other supporting data; (2) that the Architect has made exhaustive or continuous on-site inspections; or (3) that the Architect has made examinations to ascertain how or for what purposes the Construction Manager has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.Manager.

§ 11.1.13 By submitting the Application for Payment, Construction Manager represents that the Work covered by the Application has progressed to the point indicated, has been performed in accordance with the requirements of the Contract Documents and all amounts shown on previous Applications have been paid to Subcontractors and suppliers.

§ 11.1.14 The Architect shall be entitled to withhold certification and the Owner shall be entitled to withhold payment as provided in Article 9 of the General Conditions and the Contract Documents.

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§11.1.14 The Construction Manager shall submit with each Pay Request an updated detailed Construction Schedule in a format approved by the Architect showing the percent complete for each item as of the date of the Pay Request. For any Work that is behind schedule, the Construction Manager shall include a corrective work plan itemizing the steps the Contractor shall take to return the Project to being within the Contract schedule duration.

§ 11.2 Final Payment

§ 11.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Construction Manager when

- .1 the Construction Manager has fully performed the Contract, except for the Construction Manager's responsibility to correct Work as provided in Article 12 of AIA Document A201-2017, and to satisfy other requirements, if any, which extend beyond final payment;
- .2 the Construction Manager has submitted a final accounting for the Cost of the Work and a final Application for Payment; and
- .3 a final Certificate for Payment has been issued by the Architect in accordance with ~~Section 11.2.2.2~~ Section 11.2.2.2: and
- .4 all requirements in Section 9.10.2 of AIA Document A201-2017 have been met.

§ 11.2.2 Within 30 days of the Owner's receipt of the Construction Manager's final accounting for the Cost of the Work, the Owner shall conduct an audit of the Cost of the Work or notify the Architect that it will not conduct an audit.

§ 11.2.2.1 If the Owner conducts an audit of the Cost of the Work, the Owner shall, within 10 days after completion of the audit, submit a written report based upon the auditors' findings to the Architect.

§ 11.2.2.2 Within seven days after receipt of the written report described in Section 11.2.2.1, or receipt of notice that the Owner will not conduct an audit, and provided that the other conditions of Section 11.2.1 have been met, the Architect will either issue to the Owner a final Certificate for Payment with a copy to the Construction Manager, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding a certificate as provided in Article 9 of AIA Document A201-2017. The time periods stated in this Section 11.2.2 supersede those stated in Article 9 of AIA Document A201-2017. The Architect is not responsible for verifying the accuracy of the Construction Manager's final accounting.

§ 11.2.2.3 If the Owner's auditors' report concludes that the Cost of the Work, as substantiated by the Construction Manager's final accounting, is less than claimed by the Construction Manager, the Construction Manager shall be entitled to request mediation of the disputed amount without seeking an initial decision pursuant to Article 15 of AIA Document A201-2017. A request for mediation shall be made by the Construction Manager within 30 days after the Construction Manager's receipt of a copy of the Architect's final Certificate for Payment. Failure to request mediation within this 30-day period shall result in the substantiated amount reported by the Owner's auditors becoming binding on the Construction Manager. Pending a final resolution of the disputed amount, the Owner shall pay the Construction Manager the amount certified in the Architect's final Certificate for Payment. **SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.**

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

For any uncorrected punch list items at the time after Substantial Completion, the Owner may hold an amount of money equal to two (2) times the value of the items. This money withheld shall be designated as money withheld for non-conforming Work. The Construction Manager and any Subcontractor with punch list items shall correct, to the satisfaction of the Architect and Owner, all items on its punch list prior to final payment.

§ 11.2.4 If, subsequent to final payment, and at the Owner's request, the Construction Manager incurs costs, described in Sections 7.1 through 7.7, and not excluded by Section 7.9, to correct defective or nonconforming Work, the Owner shall reimburse the Construction Manager for such costs, and the Construction Manager's Fee applicable thereto, on the same basis as if such costs had been incurred prior to final payment, but not in excess of the Guaranteed Maximum Price. If adjustments to the Contract Sum are provided for in Section 6.1.7, the amount of those adjustments shall be recalculated, taking into account any reimbursements made pursuant to this Section 11.2.4 in determining the net amount to be paid by the Owner to the Construction Manager.

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§ 11.2.5 Notwithstanding any other provision of this Agreement to the contrary, any rights of the Owner or Owner's Representative to audit the Construction Manager's records shall pertain at any time during construction and within one (1) year following Final Completion of the Work, or such longer period required by a grant or other funding source.

§ 11.2.6 SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.

§ 11.3 Interest

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

~~% Prime rate at Owner's Bank plus one percentage point~~

ARTICLE 12 DISPUTE RESOLUTION

§ 12.1 Initial Decision Maker

§ 12.1.1 Any Claim between the Owner and Construction Manager shall be resolved in accordance with the provisions set forth in this Article 12 and Article 15 of A201-2017. However, for Claims arising from or relating to the Construction Manager's Preconstruction Phase services, no decision by the Initial Decision Maker shall be required as a condition precedent to mediation or binding dispute resolution, and Section 12.1.2 of this Agreement shall not apply.

§ 12.1.2 The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201-2017 for Claims arising from or relating to the Construction Manager's Construction Phase services, unless the parties appoint below another individual, not a party to the Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 12.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by mediation pursuant to Article 15 of AIA Document A201-2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

- Arbitration pursuant to Article 15 of AIA Document A201-2017
- Litigation in a court of competent jurisdiction
- Other: (Specify)

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

ARTICLE 13 TERMINATION OR SUSPENSION

§ 13.1 Termination Prior to Execution of the Guaranteed Maximum Price Amendment

§ 13.1.1 If the Owner and the Construction Manager do not reach an agreement on the Guaranteed Maximum Price, the Owner may terminate this Agreement upon not less than seven days' written notice to the Construction Manager, and the Construction Manager may terminate this Agreement, upon not less than seven days' written notice to the Owner.

§ 13.1.2 In the event of termination of this Agreement pursuant to Section 13.1.1, the Construction Manager shall be compensated for verifiable and documented Preconstruction Phase services and Work performed prior to receipt of a

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notice of termination, in accordance with the terms of this Agreement. In no event shall the Construction Manager's compensation under this Section exceed the compensation set forth in Section 5.1.

§ 13.1.3 Prior to the execution of the Guaranteed Maximum Price Amendment, the Owner may terminate this Agreement upon not less than seven days' written notice to the Construction Manager for the Owner's convenience and without cause, and the Construction Manager may terminate this Agreement, upon not less than seven days' written notice to the Owner, for the reasons set forth in Article 14 of A201–2017.

§ 13.1.4 In the event of termination of this Agreement pursuant to Section 13.1.3, the Construction Manager shall be equitably compensated for Preconstruction Phase services and Work performed prior to receipt of a notice of termination. In no event shall the Construction Manager's compensation under this Section exceed the compensation set forth in Section 5.1.

§ 13.1.5 If the Owner terminates the Contract pursuant to Section 13.1.3 after the commencement of the Construction Phase (where Construction Phase services have been authorized pursuant to a limited Notice to Proceed) but prior to the execution of the Guaranteed Maximum Price Amendment, the Owner shall pay to the Construction Manager an amount calculated as follows, which amount shall be in addition to any compensation paid to the Construction Manager under Section 13.1.4:

- .1 Take the Cost of the Work incurred by the Construction Manager to the date of termination;
- .2 Add the Construction Manager's Fee computed upon the Cost of the Work to the date of termination at the rate stated in Section 6.1 or, if the Construction Manager's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion; and
- .3 Subtract the aggregate of previous payments made by the Owner for Construction Phase services.

§ 13.1.6 The Owner shall also pay the Construction Manager fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Construction Manager that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section ~~13.1.5.1~~ 13.1.5.1, but not for any consequential, special, or punitive damages. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Construction Manager shall, as a condition of receiving the payments referred to in this Article 13, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Construction Manager, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Construction Manager under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Construction Manager will contain provisions allowing for assignment to the Owner as described above.

§ 13.1.6.1 If the Owner accepts assignment of subcontracts, purchase orders or rental agreements as described above, the Owner will reimburse or indemnify the Construction Manager for all costs arising under the subcontract, purchase order or rental agreement, if those costs would have been reimbursable as Cost of the Work if the contract had not been terminated. If the Owner chooses not to accept assignment of any subcontract, purchase order or rental agreement that would have constituted a Cost of the Work had this agreement not been terminated, the Construction Manager will terminate the subcontract, purchase order or rental agreement and the Owner will pay the Construction Manager the reasonable costs ~~necessarily~~ incurred by the Construction Manager because of such termination.

§ 13.2 Termination or Suspension Following Execution of the Guaranteed Maximum Price Amendment

§ 13.2.1 Termination

~~The Following execution of the Guaranteed Maximum Price Amendment and subject to the provisions of Section 13.2.1.2 and 13.2.1.3 below, the Contract may be terminated by the Owner or the Construction Manager as provided in Article 14 of AIA Document A201–2017.~~

§ 13.2.1.2 If the Owner terminates the Contract after execution of the Guaranteed Maximum Price Amendment, the amount payable to the Construction Manager pursuant to Sections 14.2 and 14.4 of A201–2017 shall not exceed the amount the Construction Manager would otherwise have received.

§ 13.2.1.3 If the Construction Manager terminates the Contract after execution of the Guaranteed Maximum Price Amendment, the amount payable to the Construction Manager under Section 14.1.3 of A201–2017 shall not exceed the

amount the Construction Manager would otherwise have received. The Construction Manager shall not be entitled to receive the Construction Manager's fee for Work not actually completed.

§ 13.2.2 Termination by the Owner for Cause

§ 13.2.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A201–2017, the amount, if any, to be paid to the Construction Manager under Article 14 of AIA Document A201–2017 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed an amount calculated as follows:

- .1 Take the Cost of the Work incurred by the Construction Manager to the date of termination;
- .2 Add the Construction Manager's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 6.1 or, if the Construction Manager's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A201–2017.

§ 13.2.2.2 The Owner shall also pay the Construction Manager fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Construction Manager that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 13.2.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Construction Manager shall, as a condition of receiving the payments referred to in this Article 13, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Construction Manager, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Construction Manager under such subcontracts or purchase orders.

§ 13.2.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Construction Manager a termination fee as follows:

(Insert the amount of or method for determining the fee, if any, payable to the Construction Manager following a termination for the Owner's convenience.)

This Agreement may be terminated for the Owner's convenience if the Owner in its absolute and sole discretion determines that circumstance, including but not limited to financing or regulatory matters, make it prudent to do so. In that event, the Construction Manager's exclusive remedy shall be the Cost of the Work incurred by the Construction Manager prior to notice of termination, and the Fee application to those costs.

§13.2.4 Upon any termination of this Agreement, the Construction Manager shall:

- .1 Unless the notice directs otherwise, immediately discontinue the Work on that date and to the extent specified in the notice;
- .2 Place or execute no further orders or subcontracts for materials, equipment, services, or facilities, except as may be necessary for completion of such portion of the Work as is not discontinued;
- .3 As directed by the Owner, cancel or transfer or assign to the Owner all or any of the commitments and agreements made by the Construction Manager related to the Project;
- .4 As directed by the Owner, assign or promptly make every reasonable effort to cancel, upon terms satisfactory to the Owner, all orders and subcontracts, and do only such Work as may be necessary to preserve and protect Work already in progress and to protect materials, plants, and equipment on the site or in transit thereto.

§ 13.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017; in such case, the Guaranteed Maximum Price and Contract Time shall be increased as provided in Article 14 of AIA Document A201–2017, except that the term "profit" shall be understood to mean the Construction Manager's Fee as described in Sections 6.1 and 6.3.5 of this Agreement.

§ 13.4 Other Conditions of Termination

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§ 13.4.1 Compensation calculated under this provision shall be the full, fair and final compensation allowed to Construction Manager, and Construction Manager shall sign a full release and settlement agreement in favor of the Owner as a condition precedent to receiving payment under this section.

§ 13.4.2 If the Construction Manager terminates the Contract after execution of the Guaranteed Maximum Price Amendment, the amount payable to the Construction Manager under Section 14.1.3 of A201-2017 shall not exceed the amount the Construction Manager would otherwise have received under Sections 13.1.2 and 13.1.5.

ARTICLE 14 MISCELLANEOUS PROVISIONS

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

§ 14.2 Successors and Assigns

§ 14.2.1 The Owner and Construction Manager, respectively, bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 14.2.2 of this Agreement, and in Section 13.2.2 of A201–2017, as amended, neither party to the Contract shall assign the Contract or any of its rights or obligations hereunder, nor may it contract with third parties to perform any of its obligations hereunder except as contemplated in this Agreement as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 14.2.2 The Owner may, without consent of the Construction Manager, 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 Construction Manager shall execute all consents reasonably required to facilitate the assignment.

§ 14.3 Insurance and Bonds

§ 14.3.1 Preconstruction Phase

The Construction Manager shall maintain the following insurance for the duration of the Preconstruction Services performed under this Agreement. ~~If any of the requirements set forth below exceed the types and limits the Construction Manager normally maintains, the Owner shall reimburse the Construction Manager for any additional cost.~~

§ 14.3.1.1 Commercial General Liability with policy limits of not less than two million dollars (\$ 2,000,000.00) for each occurrence and two million dollars (\$ 2,000,000.00) in the aggregate for bodily injury and property damage.

§ 14.3.1.2 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Construction Manager with policy limits of not less than one million dollars (\$ 1,000,000.00) 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.

§ 14.3.1.3 The Construction Manager 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 that such primary and excess or umbrella liability insurance policies result in the same or greater coverage as the coverages required under Sections 14.3.1.1 and 14.3.1.2, 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.

§ 14.3.1.4 Workers’ Compensation at statutory limits and Employers Liability with policy limits not less than one million dollars (\$ 1,000,000.00) each accident, one million dollars (\$ 1,000,000.00) each employee, and one million dollars (\$ 1,000,000.00) policy limit.

§ 14.3.1.5 Professional Liability covering negligent acts, errors and omissions in the performance of professional services, with policy limits of not less than two million dollars (\$ 2,000,000.00) per claim and two million dollars (\$ 2,000,000.00) in the aggregate.

§ 14.3.1.6 Other Insurance

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

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Coverage

Builder’s Risk

Limits

Contractor shall purchase and maintain builder’s risk insurance on the entire Work. Such coverage shall be written on the completed value basis, and cover the full insurable replacement cost thereof together with mitigation coverage. The decision on which Party will provide the Builder’s Risk coverage will be made prior to the Notice to Proceed and shall be based primarily on which Party can provide the best value for the Owner.

Contractor’s Pollution Liability

\$2,000,000.00 each occurrence/\$2,000,000.00 aggregate

Umbrella/Excess Liability

\$11,000,000.00 combined single limit and aggregate limit

§ 14.3.1.7 **Additional Insured Obligations.** To the fullest extent permitted by law, the Construction Manager shall cause the primary and excess or umbrella policies for Commercial General Liability and Automobile Liability to include the Owner as an additional insured for claims caused in whole or in part by the Construction Manager’s negligent acts or omissions. The additional insured coverage shall be primary and non-contributory to any of the Owner’s insurance policies and shall apply to both ongoing and completed operations.

§ 14.3.1.8 The Construction Manager shall provide certificates of insurance to the Owner that evidence compliance with the requirements in this Section 14.3.1.

§ 14.3.2 Construction Phase

After execution of the Guaranteed Maximum Price Amendment, the Owner and the Construction Manager shall purchase and maintain insurance as set forth in AIA Document A133™–2019, Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price, Exhibit B, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 14.3.2.1 The Construction Manager shall provide bonds as set forth in AIA Document A133™–2019 Exhibit B, and elsewhere in the Contract Documents.

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

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.) **Notices.** All notices, demands or other communications to be given or delivered under or by reason of the provisions of this Agreement shall be in writing and shall be deemed to have been given when delivered personally to the recipient or when sent by email upon electronic confirmation thereof, three business days after being sent to recipient by U.S. First Class mail (postage prepaid), or one business day after being sent to the recipient by reputable overnight courier service (charges prepaid) at the appropriate address indicated below or to such other address as may be given in a notice sent to all parties hereto:

If to Owner: _____

If to Construction Manager: _____

§ 14.5 Other provisions:

§14.5.1 Notwithstanding any other provisions in this Agreement, the Construction Manager shall notify the Owner in writing within five (5) days of the beginning of any event which could lead to an increase in the General Conditions/Overhead Cost. Failure to do so will result in forfeiture of rights to an increase in the General Conditions/Overhead Cost. Weather delays shall be identified each month with the Contractor's Application for Payment, or Contractor forfeits right to such time extension.

§ 14.5.2 If the parties agree to increase the General Conditions/Overhead Cost, the basis for such increase shall be a pro-rate share of the cost identified in the attachment to Exhibit A. An increase in General Conditions/Overhead Cost shall not exceed a total cost per week established by an executed Exhibit to this Agreement.

§14.5.3 Construction Manager is responsible for keeping the Project site and interior of the facility clean and organized and to perform the necessary common area sweeping and scraping of floors and any other requirements to maintain a clean project. Construction Manager is also responsible for the final clean-up service to be provided at project completion with all the necessary cleaning materials and equipment prior to acceptance of the facility by the Owner.

§14.5.4 This Agreement shall be deemed to have been drafted and prepared by both the Owner and Construction Manager. Neither party shall be deemed to be the drafter or preparer of the instrument such that the terms of this Agreement or the conditions incorporated herein shall be construed against either party and in favor of the other.

§14.5.5 Financing Requirements. The Construction Manager understands that Owner may finance the development or construction of the Project with a lender or other third parties. Construction Manager agrees to subordinate its lien rights if any to the rights of any such lenders or third parties providing financing for the Project. Construction Manager also agrees as part of its GMP to follow any administration or reporting procedures to execute any documents required by such lenders or third parties and to cooperate with the Owner in satisfying the requests and requirements of such lenders or third parties. Further, notwithstanding anything to the contrary in this Agreement, it is understood and agreed that the Owner shall have the right to assign this Agreement, if required, to a lender for the purposes of obtaining financing for the construction and/or completion of the Project, the Construction Manager agrees to acknowledge and consent to such assignment.

§14.5.6 Communication with Construction Manager. Notwithstanding anything to the contrary in this Agreement, the Owner has not relinquished its right to communicate with the Construction Manager directly, but the Owner shall make reasonable efforts to keep the Architect informed as to the content of all communications.

§14.5.7 The Construction Manager's Proposal is incorporated by reference to this Agreement. In the event of conflict between this Agreement and provisions found in the Proposal, the provisions most favorable to the Owner shall govern and control. The Schedule and Construction Manager's Fee shall be as established by executed Amendment to this Agreement.

§ 14.5.8 The Construction Manager shall be responsible to become familiar with and comply with all of the Owner's applicable policies and procedures pertaining to the Work on this Project.

§ 14.5.9 Construction Manager warrants that it, as well as its employees, agents and Subcontractors engaged to perform Work or to provide services for the Project has and will maintain all the skills, experience, and qualifications necessary to provide the Work contemplated by the Contract Documents, including any required training, registration, certification or licensure. Construction Manager and its employees, agents and Subcontractors shall comply with all applicable policies and procedures of Owner which are provided or made available to the Construction Manager (including, for example, gifts and entertainment policy, travel policy and smoking policy). Construction Manager and its employees, agents and Subcontractors shall comply with all Owner policies and procedures applicable to on-site vendors. (a) Registration and sign-in procedures, (b) identification badges, (c) executing confidentiality statements, (d) participation in any required training, parking regulations; and (e) criminal background checks are among items that may be required for any construction personnel outside the area of Work.

§ 14.5.10 Construction Manager shall comply with, and shall ensure each of its subcontractors, suppliers, and persons for whom they are responsible shall comply with, the Owner's Ethics and Compliance Program and its Fraud, Waste, and Abuse Policy, in addition to any other applicable policies which may be adopted or amended from time to time by the Owner. The

Construction Manager certifies by entering into this Contract that neither it nor its principals nor any of its subcontractors are presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from entering into this Contract by any federal agency or by any department, agency or political subdivision of the State of Indiana. The term "principal" for purposes of this Contract means an officer, director, owner, partner, key employee or other person with primary management or supervisory responsibilities, or a person who has a critical influence on or substantive control over the operations of the Construction Manager. The Construction Manager certifies that it has verified the state and federal suspension and debarment status for all subcontractors receiving funds under this Contract and shall be solely responsible for any recoupment, penalties or costs that might arise from use of a suspended or debarred subcontractor. The Construction Manager shall immediately notify the Owner if any subcontractor becomes debarred or suspended, and shall, at the Owner's request, take all steps required by the Owner to terminate its contractual relationship with the subcontractor for work to be performed under this Contract.

§ 14.5.10 The Parties believe and intend that this contract complies with all relevant federal and state laws as well as relevant regulations and accreditation standards, including but not limited to Federal Health Care Program (as defined under 42 U.S.C. § 1320a-7b(f)) Fraud and Abuse laws (including the Anti-Kickback Statute and the Stark Law), and all of the rules and regulations promulgated pursuant to, and all of the cases or opinions interpreting such statutes and laws (collectively, "Laws"). Should either Party have a good faith belief that this contract creates a material risk of violating any such Laws, or any revisions or amendments thereto, that Party shall give written notice to the other Party regarding such belief. The Parties shall then make a good faith effort to reform the contract to comply with such Laws, and, to the extent possible, to carry out the original intention of the Parties. If, within thirty (30) days of either Party first providing notice to the other Party of the need to amend this contract to comply with the Laws, the Parties, acting in good faith, are (i) unable to mutually agree upon and make amendments or alterations to this Agreement to meet the requirements in question, or (ii) alternatively, the Parties determine in good faith that amendments or alterations to the requirements are not feasible, then Owner at its sole discretion may terminate this Contract per Article 10 herein.

§ 14.5.11 If this Agreement is a contract within the purview of Section 1861(v)(1)(I) of the Social Security Act (Section 952 of the Omnibus Reconciliation Act of 1980) and the regulations promulgated at 42 C.F.R. Part 420 in implementation thereof, the Parties agree to make available to the Comptroller General of the United States ("Comptroller General"), the Secretary of the Department of Health and Human Services ("Secretary") and their duly authorized representatives, for four (4) years after the latest furnishing of services pursuant to this Agreement, access to the books, documents and records and such other information as may be required by the Comptroller General or Secretary to verify the nature and extent of the costs of services provided by each Party, respectively. If either Party, upon the approval of the other Party, carries out the duties of this Agreement through a subcontract worth \$10,000.00 or more over a 12-month period with a related organization, the subcontract will also contain an access clause to permit access by the Secretary, Comptroller General and their representatives to the related organization's books and records.

§ 14.5.12 Each Party represents and warrants to the other Parties that it (and, with respect to the Construction Manager, including itself and its subcontractors and suppliers) is not excluded from participation in any Federal Health Care Programs; debarred, suspended or otherwise excluded from participating in any other federal or state procurement or non-procurement program or activity; or designated a Specially Designated National or Blocked Person by the Office of Foreign Asset Control of the U.S. Department of Treasury. Each Party further represents and warrants that to the Party's knowledge, there are no pending or threatened governmental investigations that may lead to such exclusion. Each Party shall notify the other in writing upon the commencement of any such exclusion or investigation within seven (7) business days of receiving first notice of such exclusion or investigation. Each Party shall have the right to terminate this Agreement immediately upon learning of any such exclusion and shall be kept informed of the status of any such investigation. Construction Manager shall take reasonable steps to ascertain and ensure that its subcontractors and suppliers are not excluded from participation in any Federal Health Care Programs; debarred, suspended or otherwise excluded from participating in any other federal or state procurement or non-procurement program or activity; or designated a Specially Designated National or Blocked Person by the Office of Foreign Asset Control of the U.S. Department of Treasury.

§ 14.5.13 Construction Manager shall not be obligated or required to refer any patients to Owner, or any affiliate of Owner, to obtain or receive any medical diagnosis, care or treatment from Owner, or to purchase any health care related services or products from Owner. Neither Party is entering into this Contract with an expectation that any unlawful patient referrals will occur or develop between Owner and Construction Manager or any subcontractors or suppliers.

§ 14.5.14 The Parties agree that each shall comply with the Standards for Privacy of Individually Identifiable Health Information and all other regulations promulgated under Section 264 of the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") and other state or federal health information privacy and security laws (collectively, "Privacy Laws"). Furthermore, the Parties shall promptly amend the Agreement to conform with any new or revised Privacy Laws in order to ensure that Owner is at all times in conformance with all Privacy Laws. The Parties further agree that work will occur at a hospital where the Construction Manager or subcontractors could inadvertently obtain information protected under the regulations pertaining to the Health Insurance Portability and Accountability Act of 1996 ("HIPAA"). If Construction Manager, any representative of Construction Manager, or any Subcontractor or Supplier, or any other entity Construction Manager engages for this Project, obtains any information protected under the regulations pertaining to HIPAA, it shall notify Owner immediately and Construction Manager agrees to execute Business Associate Agreement for HIPAA compliance or take any other necessary actions required pursuant to HIPAA upon Owner's request. Construction Manager shall ensure all subcontracts it enters into for this Project require subcontractors to similarly comply with Owner related to HIPAA issues.

§ 14.5.15 Construction Manager agrees to immediately report any conflict or potential conflict of Interest to the Owner and to give full disclosure of facts pertaining to any transaction or related activity that may be reasonably construed as a conflict of interest. The Construction Manager further agrees to report to the Owner the description of any influence adversely affecting the decision-making process of the Construction Manager and the performance of services under this Agreement.

§ 14.5.16 The parties acknowledge and agree that there is a project labor agreement (PLA) in place that bears upon the labor rates for the Project.

§14.6 SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.

§14.7 SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.

ARTICLE 15 SCOPE OF THE AGREEMENT

§ 15.1 This Agreement represents the entire and integrated agreement between the Owner and the Construction Manager and supersedes all prior negotiations, representations or agreements, either written or oral. This Agreement may be modified or amended only by written instrument signed by both Owner and Construction Manager. Any waiver of a breach of any provision(s) of this Agreement shall not be deemed effective unless in writing and signed by the party against whom enforcement of the waiver is sought. SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.

§ 15.1.1 If any part of this Agreement shall be determined to be invalid, illegal or unenforceable by any valid Act of Congress or act of any legislature or by any regulation duly promulgated by the United States or a state acting in accordance with the law, or declared null and void by any court of competent jurisdiction, then such part shall be reformed, if possible, to conform to the law and, in any event, the remaining parts of this Agreement shall be fully effective and operative insofar as reasonably possible.

§ 15.2 The following documents comprise the Agreement:

- .1 AIA Document A133™-2019, Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price
- .2 AIA Document A133™-2019, Exhibit A, Guaranteed Maximum Price Amendment, if executed
- .3 ~~AIA Document A133™-2019, Exhibit B, Insurance and Bonds~~
- .4 ~~AIA Document A201™-2017, General Conditions of the Contract for Construction~~
- .5 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 Other Exhibits: **SEE EXHIBIT H-USDA Attachment 5 to AIA Document A133-2019 for revisions.**
(Check all boxes that apply.)

AIA Document E234™-2019, Sustainable Projects Exhibit, Construction Manager as Constructor Edition, dated as indicated below:
(Insert the date of the E234-2019 incorporated into this Agreement.)

Supplementary and other Conditions of the Contract:

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

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

~~Exhibit B General Conditions Form from RFP with Attachments~~
Exhibit C AIA Document A201-2017 General Conditions of the Contract for Construction with USDA RD Instruction 1942-A Attachment 4
Exhibit D Construction Manager's Insurance Certificate
Exhibit E Work Performed by Construction Manager's Own Personnel
~~Exhibit F Program - Reference Section 1.1.1~~
~~Exhibit G Schedule - Reference Section 1.1.4~~
Exhibit H USDA RD Instruction 1942-A Guide 27 Attachment 5

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

SEE EXHIBIT H-USDA Attachment 5 for Signature Block.

OWNER (Signature)

CONSTRUCTION MANAGER (Signature)

(Printed name and title)

(Printed name and title)



AIA® Document A133® – 2019 Exhibit A

Guaranteed Maximum Price Amendment

This Amendment dated the TBD day of TBD in the year TBD, is incorporated into the accompanying AIA Document A133™–2019, Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price dated the TBD day of TBD in the year TBD (the "Agreement")
(In words, indicate day, month, and year.)

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

Sullivan County Community Hospital
Proposed First Phase of Implementation to the Sullivan County Community Hospital campus as defined in the Master Plan documents prepared by JJCA dated December 13, 2022.

The Project will consist of three parts. The three parts are:

- Project Zero: Infrastructure Upgrades
- Project One: New Medical Office Building
- Project Two: Hospital Addition

Sullivan, IN

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

Sullivan County Community Hospital
2200 N. Section Street
Sullivan, IN 48772

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

TBD

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

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

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ARTICLE A.1 GUARANTEED MAXIMUM PRICE

§ A.1.1 Guaranteed Maximum Price

Pursuant to Section 3.2.6 of the Agreement, the Owner and Construction Manager hereby amend the Agreement to establish a Guaranteed Maximum Price. As agreed by the Owner and Construction Manager, the Guaranteed Maximum Price is an amount that the Contract Sum shall not exceed. The Contract Sum consists of the Construction Manager’s Fee plus the Cost of the Work, as that term is defined in Article 6 of the Agreement.

§ A.1.1.1 The Contract Sum is guaranteed by the Construction Manager not to exceed TBD (\$ TBD), subject to additions and deductions by Change Order as provided in the Contract Documents.

§ A.1.1.2 Itemized Statement of the Guaranteed Maximum Price. Provided below is an itemized statement of the Guaranteed Maximum Price organized by trade categories, including allowances; the Construction Manager’s contingency; alternates; the Construction Manager’s Fee; and other items that comprise the Guaranteed Maximum Price as defined in Section 3.2.1 of the Agreement.
(Provide itemized statement below or reference an attachment.)

§ A.1.1.3 The Construction Manager’s Fee is set forth in Section 6.1.2 of the Agreement.

§ A.1.1.4 The method of adjustment of the Construction Manager’s Fee for changes in the Work is set forth in Section 6.1.3 of the Agreement.

§ A.1.1.5 Alternates

§ A.1.1.5.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price
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§ A.1.1.5.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Exhibit A. Upon acceptance, the Owner shall issue a Modification to the Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance
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§ A.1.1.6 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
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ARTICLE A.2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ A.2.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

The date of execution of this Amendment.

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 execution of this Amendment.

§ A.2.2 Unless otherwise provided, the Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work. The Contract Time shall be measured from the date of commencement of the Work.

§ A.2.3 Substantial Completion

§ A.2.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Construction Manager shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

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

By the following date:

§ A.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 Construction Manager shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
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§ A.2.3.3 If the Construction Manager fails to achieve Substantial Completion as provided in this Section A.2.3, liquidated damages, if any, shall be assessed as set forth in Section 6.1.6 of the Agreement.

ARTICLE A.3 INFORMATION UPON WHICH AMENDMENT IS BASED

§ A.3.1 The Guaranteed Maximum Price and Contract Time set forth in this Amendment are based on the Contract Documents and the following:

§ A.3.1.1 The following Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
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§ A.3.1.2 The following Specifications:

(Either list the Specifications here, or refer to an exhibit attached to this Amendment.)

Section	Title	Date	Pages
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§ A.3.1.3 The following Drawings:

(Either list the Drawings here, or refer to an exhibit attached to this Amendment.)

Number	Title	Date
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§ A.3.1.4 The Sustainability Plan, if any:

(If the Owner identified a Sustainable Objective in the Owner's Criteria, identify the document or documents that comprise the Sustainability Plan by title, date and number of pages, and include other identifying information. The Sustainability Plan identifies and describes the Sustainable Objective; the targeted Sustainable Measures; implementation strategies selected to achieve the Sustainable Measures; the Owner's and Construction Manager's roles and responsibilities associated with achieving the Sustainable Measures; the specific details about design reviews, testing or metrics to verify achievement of each Sustainable Measure; and the Sustainability Documentation required for the Project, as those terms are defined in Exhibit C to the Agreement.)

Title

Date

Pages

Other identifying information:

§ A.3.1.5 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item

Price

§ A.3.1.6 Assumptions and clarifications, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption and clarification.)

§ A.3.1.7 The Guaranteed Maximum Price is based upon the following other documents and information:
(List any other documents or information here, or refer to an exhibit attached to this Amendment.)

ARTICLE A.4 CONSTRUCTION MANAGER'S CONSULTANTS, CONTRACTORS, DESIGN PROFESSIONALS, AND SUPPLIERS

§ A.4.1 The Construction Manager shall retain the consultants, contractors, design professionals, and suppliers, identified below:
(List name, discipline, address, and other information.)

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

Sullivan County Community Hospital _____ TBD _____

OWNER (Signature)

CONSTRUCTION MANAGER (Signature)

(Printed name and title)

(Printed name and title)



AIA[®] Document A201[®] – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Sullivan County Community Hospital
Proposed First Phase of Implementation to the Sullivan County Community Hospital
campus as defined in the Master Plan documents prepared by JJCA dated December 13,
2022.

The Project will consist of three parts. The three parts are:

Project Zero: Infrastructure Upgrades

Project One: New Medical Office Building

Project Two: Hospital Addition

Sullivan, IN

THE OWNER:

(Name, legal status and address)

Sullivan County Community Hospital
2200 N. Section Street
Sullivan, IN 48772

THE ARCHITECT:

(Name, legal status and address)

Johnson Johnson Crabtree Architects P.C.
4551 Trousdale Drive
Nashville, TN 37215

THE OWNER'S REPRESENTATIVE:

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

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith. To the extent that the Contract Documents refer to an Initial Decision Maker, the Owner shall act in that capacity.

§ 1.1.9 CONSTRUCTION MANAGER

Any reference in the General Conditions or other Contract Documents to "Contractor" or "General Contractor" shall mean and include Construction Manager as may be identified in the Agreement.

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§ 1.1.10 KNOWLEDGE

The terms "knowledge," "recognize" or "discover" and similar terms in the Contract Documents shall mean that which the Contractor should know, recognize or discover in the exercise of reasonable care, skill and diligence by a competent contractor on healthcare projects of comparable size, cost and complexity. Likewise, the term "reasonably inferable" shall mean reasonably inferable by a Contractor familiar with the Project and exercising the skill, care and diligence expected of a competent contractor on healthcare projects of comparable size, cost and complexity.

§ 1.1.11 AS-BUILT DRAWINGS

As-built drawings are prepared by the Contractor showing on-site changes to the original Drawings reflecting the actual construction of the Project.

§ 1.1.12 Build America, Buy America Act (BABAA)

§ 1.1.12.1 Build America, Buy America Act (BABAA) – Requirements instituted by the Bipartisan Infrastructure Law of 2021 mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States.

§ 1.1.12.2 Construction Materials – Those articles, materials, or supply-other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives- that are or consist primarily of: non-ferrous metals, plastic and polymer-based products, glass, lumber or drywall.

§ 1.1.12.3 Manufactured Product - Items assembled out of components, or otherwise made or processed from raw materials into finished products. Manufactured products must be manufactured (assembled) in the United States, and the cost of components that were mined, produced, or manufactured in the United States must be greater than 55 percent of the total cost of all components of the project.

§ 1.1.12.4 Manufacturer's Certification – Documentation provided by a Manufacturer, certifying that the items provided by Manufacturer meet the domestic preference requirements of BABAA.

§ 1.1.13 Domestic Preference Definitions

§ 1.1.13.1 Build America, Buy America (BABA) – Requirements mandated by the Infrastructure Investment and Jobs Act (Pub. L. No. 117.58) mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States.

§ 1.1.13.2 Construction Materials – Those articles, materials, or supply-other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives- that are or consist primarily of: non-ferrous metals, plastic and polymer-based products, glass, lumber or drywall.

§ 1.1.13.3 Manufactured Product - Items assembled out of components, or otherwise made or processed from raw materials into finished products. Manufactured products must be manufactured (assembled) in the United States, and the cost of components that were mined, produced, or manufactured in the United States must be greater than 55 percent of the total cost of all components of the project.

§ 1.1.13.4 Manufacturer's Certification – Documentation provided by the Manufacturer stating that Domestic Preference requirements of Build America, Buy America have been satisfied for all provided items. If items are purchased via a Supplier, distributor, vendor, etc., then the Supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certifications to the parties purchasing the products. Contractor shall include a Manufacturer's Certification for compliance with Build America, Buy America requirements, or an approved waiver, and supporting data, as applicable.

§ 1.1.13.5 Architect/Engineer's review and approval of a Shop Drawing or Sample shall include review of Manufacturers' Certifications and/or waivers to document compliance with Build America, Buy America requirements, as applicable.

§ 1.1.13.6 Contractor shall certify upon Substantial Completion that all Work and Materials have complied with Build America, Buy America domestic preference requirements. Contractor shall provide Certification to Owner and Agency. Refer to Contractor's Certification provided in these Contract Documents.

§ 1.1.13.7 For Owner-authorized changes in the Work, the Contractor will provide the Manufacturer's Certification, or waiver, for materials subject to Build America, Buy American requirements except when a sole source item is specified, in which case the Architect/Engineer will provide the Manufacturer's Certification, or waiver.

§ 1.1.13.8 Installation of materials that are non-compliant with Build America, Buy America domestic preference requirements shall be considered defective work, to be replaced at Contractor's expense. Contractor should ensure that Architect/Engineer has an approved Manufacturers' Certification, or waiver, prior to any domestic preference compliant item being delivered to the project site.

§ 1.1.13.9 Contractor shall also submit, at project completion the Contractor's Certification of Compliance certifying that to the best of the Contractor's knowledge and belief all Manufactured Products, and Construction Materials proposed in the Shop Drawings, Change Orders, Partial Payment Estimates, and those installed for the Project, comply with the Build America, Buy America (BABA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act of 2021, or are subject to an approved waiver.

§ 1.1.13.10 Maintain all Manufacturers' Certifications and waivers in the project file and on-site during construction to ensure compliance with Build America, Buy America domestic preference requirements, as applicable.

§ 1.1.14 The term "Open Book" means the Contractor will provide and make available to Owner a fully transparent and detailed breakdown of all costs of the Work on an "open book" basis, including overhead, fees, discounts, supplies, subcontractors, materials, labor hours and rates, and equipment, for the Contractor and its subcontractors, vendors, and suppliers.

§ 1.1.15 The term "Final Completion" means the acceptance of the final payment by Contractor in accordance with Section 9.10.5 below.

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract. In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes, and ordinances, the Contractor shall (i) provide the better quality or greater quantity of Work or (ii) comply with the more stringent requirement; either or both in accordance with the Architect's interpretation. The terms and conditions of this Section 1.2.1.1, however, shall not relieve the Contractor of any of the obligations set forth in Sections 3.2 and 3.7.

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

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

§ 1.2.4 See USDA Attachment 4 for revision.

§ 1.2.5 Sections of Division 1 of the Specifications – General Requirements, govern the execution of all sections of the Specifications.

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§ 1.2.6 Scope paragraphs placed at the beginning of the Sections of the Specifications present a brief indication of the principal Work included in that Section, but do not limit Work to subject mentioned nor purport to itemize Work that may be included.

§ 1.2.7 The Relation of Specifications and Drawings shall be that of equal authority and priority. Should they disagree in themselves, or with each other, the provision or interpretation resulting in the greater quantity and/or quality of work indicated shall apply. The appropriate Work, in the event of the above mentioned disagreements, shall be determined by the Architect in consultation with the Owner.

§ 1.2.8 Should the Drawings disagree in themselves, figures shall govern over scaled measurements, large scaled drawings shall govern over small scale drawings, the great quantity and quality of work or materials shall be furnished and performed; the descriptive writings shall govern over legends indicated material or conditions and the Agreement takes precedence over all other Contract Documents.

§ 1.2.9 Failure to report a conflict in the Contract Documents shall be deemed evidence that the Contractor has elected to proceed in the manner called for in 1.2.6 and/or 1.2.7.

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.5.3 Reproduction of any portion of the Architect's Construction Documents for use as submittals for Shop Drawings is not acceptable.

§ 1.5.4 To the extent that the provisions of this Section 1.5 are inconsistent with any provision of the Architect's Agreement, the provisions of the Architect's Agreement shall prevail.

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor. Owner may require notice to the Contractor if subsequently there is a material variance in such financial arrangements.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants,

sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

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

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

§ 2.3.3 If the employment of either the Owner's Representative or the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect/Owner's Representative or Architect, as applicable.

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

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

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2. **See USDA Attachment 4 for revision.**

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

§ 2.6 OWNER'S CUMULATIVE AND ADDITIONAL RIGHTS

§ 2.6.1 The rights of the Owner as stated in the Contract Documents are cumulative, additional to and not in limitation of any rights Owner may have in law or equity. In no event shall the Owner have control over, charge of or any responsibility for construction means, methods, techniques, sequences, procedures or for any safety precautions or

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programs in connection with the Work, notwithstanding any rights or authority granted to the Owner in the Contract Documents.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement as the Construction Manager who is signatory to the A133 2019 Agreement with Owner and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative. All references to Contractor herein shall mean "Construction Manager."

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

§ 3.1.2.1 The Contractor shall be responsible for ascertaining correct dimensions, and Contractor is not to ascertain dimensions simply by scaling drawings. In case of any discrepancy between Drawings and Specifications, Contractor shall consult Architect promptly for an interpretation before proceeding with the Work.

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. The Contractor further acknowledges and represents that Contractor has visited and examined the site, become generally familiar with local conditions under which the Work is to be performed and has correlated personal observations with requirements of the Contract Documents. In connection therewith, Contractor specifically represents to the Owner that it has, by careful examination, satisfied itself as to: (a) the nature and character of the area in which the Project is located, including, without limitation, site access, available labor supply costs, available equipment supply and costs, transportation, disposal, handling and storage of materials and waste, roads, weather and ground water table; (b) the quality and quantity of all materials, supplies, tools, equipment, labor and services of any kind necessary to complete the Work within the Contract Sum and Contract Time specified within the Contract Documents; (c) the accuracy of all grades, elevations, dimensions and locations, including the interconnection of its Work with existing or other work. In connection with the foregoing, after having carefully examined all Contract Documents, and having visited the Project site, Contractor acknowledges and declares that it has no knowledge of any discrepancies, omissions, ambiguities, or conflicts in and among said Contract Documents and that if it becomes aware of any such discrepancies, omissions, ambiguities, or conflicts, it shall promptly notify Owner and Architect of such fact. No Claims for additional compensation or time shall be allowed resulting from Contractor's failure to familiarize itself with visible site conditions.

§ 3.2.1.1 Likewise, any Subcontractor performing Work on this Project shall have evaluated and satisfied themselves as to the conditions and limitations under which all or any part of the Work is to be performed including, the location, condition, layout and nature of the Project site and surrounding areas; generally prevailing climactic conditions; anticipated labor supply and costs; availability and costs of materials, tools and equipment; The Owner shall not have responsibility for the physical condition or safety of the Project site, and Contractor shall be solely responsible for site safety. The Owner shall not allow any adjustment to the Contract Time or Contract Sum resulting from any failure by Contractor or any Subcontractor to comply with these requirements.

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

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

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

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

§ 3.3 Supervision and Construction Procedures

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

§ 3.3.1.1 The Contractor shall review any specified or recommended construction or installation procedure, including those recommended by manufacturers, and shall advise the Architect:

- .1 If the procedure deviates from good construction practice;
- .2 If following the procedure will affect any warranties, including the Contractor's general warranty;
- .3 Of any objections the Contractor may have to the procedure; and
- .4 If the Contractor proposes any alternative procedure which the Contractor is willing to warrant.

§ 3.3.1.2 The Contractor shall engage Workers who are skilled in performing the Work, and all Work shall be performed with care and skill and in a workmanlike manner under the full-time supervision of a qualified foreman. The Contractor shall advise the Owner and Architect if the Contractor has knowledge of: (a) any specified product that deviates from good construction practices; (b) Specifications that will adversely affect any warranties; and (c) any objections which the Contractor may have to the Specifications.

§ 3.3.1.3 The Contractor acknowledges its obligation to complete the Work in accordance with the Contract Documents. Contractor acknowledges that Owner's representative shall have no duty or responsibility to Contractor except where specifically stated herein and no act or failure to act by Owner's representative shall relieve Contractor of its obligations to perform the Work required by the Contract Documents.

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

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

§ 3.3.4 In the event Contractor desires to self perform any of the Work or subcontract with a "related entity" being any entity with shared management or ownership with Contractor, Contractor shall, within thirty (30) days of the execution of the Agreement, inform Owner of all portions of the Work which Contractor wishes to self perform and comply with the Contract Documents. Contractor's lump sum bid for such portion of the Work shall include all labor, material, equipment, warranty, general conditions, and fees associated with such Work. Owner reserves the rights to require Contractor to obtain bids from unrelated entities and to require the Contractor to perform all Work with unrelated entities with no adjustment to the Contract Sum or Contract Time.

§ 3.3.5 Contractor shall maintain a daily report which shall record the date, weather conditions, deliveries received, subcontractors on site, general description of Work accomplished and problems or conflicts in the field. Said reports shall be maintained at the Project in an orderly manner and available to Owner and/or its designated representative for review at any time upon reasonable request. Contractor shall submit the format of such daily report to Owner for approval prior to commencement of the Work.

§ 3.3.6 In the event that Contractor discovers any damage to or deficiency in the Work, Contractor shall provide Owner prompt written notice of any such damage, defect or deficiency of any Work or Equipment whether furnished by Owner or Contractor. Should Contractor fail to notify Owner of any such damage or deficiencies that Contractor could have reasonably discovered, by inspection or testing per the Contract Documents, Contractor shall be responsible to remedy the damage, defect or deficiency at its sole cost and expense.

§ 3.3.7 Contractor shall review and acknowledge all forms included as Exhibits to the Contract Documents relating to the performance of the Work.

§ 3.3.8 Contractor shall fully comply with all known federal, state, local, industry and Owner's requirements regulating any aspect of the Work or the performance of the Work.

§ 3.3.9 The Contractor shall as a part of the Work, supervise, schedule and coordinate the Owner vendors whose Work is done during construction to include, but not limited to cabling, low voltage systems, security card access and CCTV, paging, audio-visual and similar systems.

§ 3.4 Labor and Materials

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

§ 3.4.1.1 Unless otherwise provided in the Contract Documents, all equipment, material, and articles incorporated into the Work shall be new and of the most suitable grades. The Contractor shall inspect all materials delivered to the Project and shall reject any observably defective materials. Materials shall conform to manufacturer's standards in effect at the date of execution of the Agreement and shall be installed in strict accordance with the manufacturer's latest direction. Contractor shall, if required by Owner or Architect, furnish satisfactory evidence as to the kind or quality of any materials. All package materials shall be shipped to the Project in the original containers, clearly labeled, and delivery slips shall be submitted with bulk materials, identifying thereon the source.

§ 3.4.1.2 All material delivered to the job site shall be stored and handled in a manner to preclude inclusion of any foreign substances or causing of any discoloration therein and to prevent any damage thereto which might reduce its effectiveness as part of the Work. All Work described or required under the Contract Documents shall be performed in a first class, neat, skillful, workmanlike manner in accordance with the best recognized trade practices. Only competent workmen who satisfactorily perform their duties shall be employed to accomplish the Work, and, when requested by Owner or Architect, Contractor shall discharge and shall not reemploy any person who commits trespass or who is, in the Owner's opinion, disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect or Owner's Representative in accordance with Section 3.12.8 or ordered by the Architect or Owner's Representative in accordance with Section 7.4,

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the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive. All substitutions shall be presented to the Architect for a decision during the bid period. Substitutions after the approval of the GMP and adjustments for issuance of final Construction Documents shall not be considered unless it will result in significant cost savings to the Owner.

§ 3.4.2.1 Substitutions

§ 3.4.2.1.1 When a material, equipment or system is specified by the name of one or more manufacturers, such material, equipment, or systems shall form the basis of the Contract and shall be used in the Work.

§ 3.4.2.1.2 If the Contractor desires to make a substitution, it shall comply with the requirements of the Owner's Representative and Architect as outlined in the Agreement and Project Documents.

§ 3.4.2.1.2.3 By making a request for substitution, the Contractor:

- .1 represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respect to that specified;
- .2 represents that it will provide the same warranty for the substitution as the original product specified;
- .3 certifies that the cost data presented is complete and includes all related costs under the Contract Documents, but excludes costs under separate contracts and excludes the Architect's redesign costs, and waives all claims for additional costs related to the substitution which may subsequently become apparent; and,
- .4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

§ 3.4.2.2 Not later than 30 days from the date the Contractor is authorized to proceed with the Work, the Contractor shall provide to the Owner, the Owner's Representative, and Architect a list of names of the manufacturers proposed to be used for each of the products identified in the Contract Documents and, where applicable, the name of the Subcontractor furnishing and/or installing the product.

§ 3.4.2.3 The Architect or the Owner's Representative will promptly reply in writing to the Contractor stating whether the Owner, the Owner's Representative, or the Architect, after due investigation, has reasonable objection to any such proposal. If adequate data on any proposed manufacturer or installer is not available, the Architect may state that action will be deferred until the Contractor provides further data. Failure to object to a manufacturer shall not constitute a waiver of any of the requirements of the Contract Documents, and all products furnished by the listed manufacturer must conform to such requirements.

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the ~~Owner~~ Owner, Owner's Representative and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the ~~Architect~~ Architect or Owner's Representative, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Contractor guarantees that: (1) all Work performed hereunder will be performed in a good and workmanlike manner and in accordance with all federal, state and local laws, rules and regulations applicable to Contractor's performance of the Work; and (2) the Work and the product resulting from the Work and each item of material or equipment supplied hereunder shall conform to the terms and conditions of the Contract Documents and be free from defects in workmanship and materials. Without limiting the foregoing, Contractor will assign to Owner any and all rights to enforce any manufacturer's warranty on the materials or equipment Contractor supplies hereunder. This warranty is in addition to any and all other warranties,

expressed or implied, extended by the Contractor pursuant to the provisions of this Contract or applicable law. The Contractor shall obtain from manufacturers and suppliers guarantees and warranties according to the Contract Terms and upon the optimum terms and longest periods reasonably obtainable. The Contractor shall and does assign to the Owner the benefits of all warranties and guarantees of all Subcontractors, but such assignment shall not relieve the Contractor of its warranty obligations to the Owner under the Contract Documents.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

§ 3.7.2.1 The Contractor warrants that it is familiar with applicable federal, state and local laws, ordinances, rules and regulations concerning the recognition, handling and disposal of waste materials and rubbish and it will obey such requirements. The Contractor shall provide the Owner copies of all manifests and disposal records required by any laws and regulations for any hazardous or other substances that have been handled or disposed by or through the Contractor.

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the ~~Owner~~ Owner, Owner's Representative, and the Architect before conditions are disturbed and in no event later than ~~14~~ 7 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the ~~Owner~~ Owner, Owner's Representative and Contractor, stating the reasons. If ~~either any party~~ either any party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, general conditions, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.
- .4 Contractor shall submit adjustment to allowances with each Pay Request and a final request for adjustment within 30 days of final buyout of allowance.

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

§ 3.9 Superintendent

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

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

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed. Contractor shall not make any changes to Contractor's Project team personnel presented in the response to the RFP without prior written consent of Owner. Owner shall have the right, at any time, to direct a change in Contractor's superintendent if their performance is unsatisfactory to Owner. In the event of such demand, Contractor shall, within seven (7) days after notification, replace said superintendent with a superintendent satisfactory to Owner, in Owner's sole discretion.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the ~~Contract~~, shall submit for the ~~Owner's and Architect's information~~ Contract and in no event later than thirty (30) days after executing the Agreement, shall submit for the ~~Owner's, Owner's Representative's and Architect's approval~~ Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and be in time scaled precedence format with the critical path clearly indicated. Contractor shall give notice to the Owner of any change in the logic of the schedule or any part thereof, or the removal of any restraints, or the reduction of any duration. The construction schedule shall cover all field tasks, significant material deliveries, off-site restraints such as permits, inspections and approvals, Owner activities and approvals that could affect the schedule, and milestones for start dates, completion dates and availability dates as required. Tasks shall be broken down into activities that allow monitoring monthly progress. The construction schedule shall not exceed time limits current under the Contract Documents. The schedule shall be revised Documents, shall be revised and submitted with each Application for Payment at appropriate intervals as required by the conditions of the Work and Project and Project or as requested by the Owner, 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. The Contractor, subcontractor, suppliers, consultants, or any other entity working on behalf of the Contractor

expressly agrees that in undertaking to complete Work within the time specified, Contractor has made allowances for certain foreseeable hindrances and delays. The Owner will only grant an extension of the allowable contract time when Work on the critical path is delayed by factors determined to be beyond the Contractor's control which could not be reasonably anticipated or contemplated at the time this Agreement was executed. Extension of Contract Time will not be granted for delays due in whole or in part to fault or negligence of the Contractor, or its subcontractors or suppliers

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

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the ~~Owner and Architect.~~ Owner, Owner's Representative and Architect.

§3.10.4 The Contractor shall schedule and coordinate the Work of the Owner Vendors and Contractors as defined in Article 6 and include their Work within the Project Schedule defined in 3.10.1.

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors. Submittals by the Contractor in digital format shall be endorsed by the Contractor in writing, either digitally or on paper. Submittals which are not marked as reviewed for compliance with the Contract Documents and confirmed by the Contractor may be returned by the Architect without action and all costs of return shipping and delivery of the unsigned submittal shall be charged to the Contractor.

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

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect. Any Work performed or materials ordered before approval of the required submittal shall be at Contractor's sole risk that the Work or materials may be rejected by the Architect or the Owner.

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. ~~The~~ Owner Owner, Owner's Representative, and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria contained within the Contract Documents except when specified in the Contract Documents.

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

§ 3.12.11 Contractor shall make submittals in the manner and number of copies specified in the Contract Documents.

§ 3.12.12 Nothing in the Architect's review of shop drawings and samples shall be construed as authorizing substitutions not in accordance with the procedures for substitution, the performance of additional work or the allowance of any increased cost to the Owner.

§ 3.12.13 Substitutions of material or equipment on an "or equal" basis shall not be proposed or requested in shop drawings or sample submittals unless approval is requested in accordance with the requirements of the Contract Documents. Samples may not be employed in the Work without the express written permission of the Architect and the Owner.

§ 3.12.14 The Architects' Agreement includes up to a total of two (2) reviews of each submittal. The Contractor shall reimburse the Owner for the cost of submittal review in excess of the two (2) reviews if the submittals are not complete or not submitted in accordance with the Contract Documents.

§ 3.13 Use of Site

~~The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.~~
§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. The Contractor acknowledges the ongoing operations of the Owner and agrees to coordinate the Work with the Owner and conduct the Work in a manner which minimizes or eliminates any adverse impact on the Owner. Contractor acknowledges that the property on which the Project and Work are located shall be occupied and in use during the execution of the Work, Contractor shall perform and coordinate its Work in such manner that the portions of the property occupied and in use will not be affected, interfered with or encumbered. The Contractor shall also complete and receive all necessary permits or approvals for construction as required by the Owner for work within their premises including but not limited to hot work permits, utility shutdown or interruption permits, above ceiling permits, demolition permits or other permits.

§ 3.13.2 Only materials and equipment that are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, the equipment shall be removed promptly from the Project site. The Contractor shall be solely responsible for securing and protecting materials and equipment stored on the Project site from theft, damage, weather and other adversity. The Contractor shall take all reasonable measures not to impede reasonable access to the Project site by the Owner. The Work shall be performed in such manner as to minimize the impact on adjacent areas, and the Project site as well as any adjacent area shall be free from all debris, building materials and equipment that could lead to hazardous conditions.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents. Patches in fire rated construction or construction required to be smoke tight shall be made in conformance with assemblies designed and tested by agencies recognized by governing codes. Any Underwriters Laboratories (UL) rated fire seal material, flanges, or other materials required by Code, the Contract Documents, or manufacturers installation instruction for devices penetrating the Work affected shall be applied and installed by the Contractor.

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

§ 3.14.3 Contractor shall locate, protect, and save from injury utilities of all kinds, either above or below grade, inside or outside of any structure, found in the areas affected by its Work. Contractor shall be responsible for all damage caused to such utility by the operation of equipment or delivery of materials or as the direct or indirect result of any of its work and shall repair all such damage at its expense and as a part of the Work included in the Contract Documents. Contractor shall not be entitled to any increase in the Contract Sum or Contract Time on account of such damage to any utility.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. On a regular basis throughout the performance of the Work, the Contractor shall be responsible for continuous removal of all debris, waste materials, rubbish, surplus materials or other waste from the Project site. Contractor and all Subcontractors shall deposit debris exclusively in designated waste containers at a location identified by the Owner. Neither the Contractor nor any Subcontractor shall use any of the Owner's facilities for the deposit of debris or waste materials of any kind or sort. The Contractor and all Subcontractors shall strictly comply with the requirements of federal, state and local laws, ordinances, regulations and lawful orders as well as with the Owner's policies, procedures and directives relative to maintaining the Project site.

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

§ 3.16 Access to Work

The Contractor shall provide the ~~Owner~~ Owner, Owner's Representative and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the ~~Owner~~ Owner, Owner's Representative 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~~ Owner, Owner's Representative, or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Owner, Owner's officers and directors, Architect, Architect's consultants, the Owner's Representative and agents and employees of any of them (collectively, "Indemnitees") from and against any claims, damages, losses, and expenses, including but not limited to attorneys' fees, court costs, and investigation costs, 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 caused in whole or part by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that which would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts. Contractor shall require a similar indemnification obligation in favor of the Indemnitees in each subcontract. The Contractor's indemnity obligations under this paragraph shall also include, but not be limited to, claims pertaining to payment disputes and mechanics' and materialmen's liens provided the Owner has made payment in accordance with the Contract (to the extent caused solely by the Contractor's nonpayment to one or more of its Subcontractors or suppliers). The Contractor agrees, to the extent the Owner is not made whole by insurance of whatever source, to indemnify and hold harmless the Owner from and against all claims, damages, losses, and expenses, including all attorneys' fees and costs, arising out of or resulting from the Contractor's actions and omissions and the actions and omissions of the Contractor's consultants, subcontractors, or anyone employed by the Contractor or its consultants or subcontractors or anyone for those actions and omissions the Contractor may be liable.

§ 3.18.3 To the fullest extent permitted by law, the Contractor shall also indemnify the Owner, Owner's officers, directors, employees and agents from and against any and all fines, penalties, claims, damages, liability, losses and expenses, including attorneys' fees, arising out of or relating in any way to (i) any violation of or failure to comply by Contractor or anyone for whom the Contractor is responsible with any law, statute, ordinance, rule, regulation, code, requirement or lawful order of any public authority with jurisdiction over the Work, (ii) means, methods, procedures, techniques or sequences of execution or performance of the Work, (iii) failure to secure and pay for permits, fees, approvals, licenses or inspections as required under the Contract Documents, (iv) any violation of any permit or other approval by the Contractor or anyone for whom the Contractor is responsible, and (v) any lien asserted against the Owner's property relating in any way to the Project.

§ 3.18.4 The Contractor shall indemnify and hold harmless the Owner from and against all costs and fees, including actual attorney fees, incurred in enforcing the Contractor's obligations for defense and indemnification in the Contract Documents.

§ 3.19 BABAA Requirements

§ 3.19.1 All products must meet BABAA requirements.

§ 3.19.2 Contractor shall include Manufacturer's Certification for BABAA requirements with all applicable submittals. If a specific manufacturer is used in the bidding, a statement that each applicable Manufacturer will comply with VAVAA, must be included with the bid submission. Contractor shall comply with BABAA requirements, including coordination with manufacturers, distributors, and suppliers to correct deficiencies in any BABAA requirement and documentation.

§ 3.19.3 Engineer/Architect approval of shop drawings or samples shall include review of BABAA documentation.

§ 3.19.4 Contractor shall certify upon completion that all work and materials have complied with BABAA requirements.

§ 3.19.5 For any change orders, Contractor shall provide BABAA compliant documentation for any new products or materials required by the change.

§ 3.19.6 Installation of materials or products that are not compliant with BABAA's requirements shall be considered defective work. An approved Manufacturer's Certification or waiver prior to items being delivered to the project site is required.

§ 3.19.7 By submitting an application for payment, based in whole or in part on furnishing equipment or materials, Contractor certifies that such equipment and materials, to Contractor's knowledge, are compliant with BABAA requirements.

§ 3.20 Persons Authorized to Sign Documents

The Contractor, within five days after the date of Notice to Proceed or the date of this Agreement, whichever comes first, shall file with the Owner, the Owner's Representative, and the Architect a list of all persons who are authorized to sign documents such as contracts, certifications, and affidavits on behalf of the Contractor, and to fully bind the Contractor to all the conditions and provisions of such documents.

ARTICLE 4 ARCHITECT AND OWNER'S REPRESENTATIVE

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement. The Owner shall also retain a Owner's Representative. That person or entity is identified as the Owner's Representative (aka Owner's Representative) in the Agreement. See USDA Attachment 4 for revision.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Owner's Representative, with assistance from 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 Owner's Representative and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

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

§ 4.2.3 On the basis of the site visits, the Owner's Representative and 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 Owner's Representative and Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Owner's Representative and Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

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

§4.2.4.1 Any direct communications between Owner and Contractor that affect the performance or administration of the Contract shall be made or confirmed in writing, with copies to the Architect, and any such communications that represent a modification of the Contract requirements shall be documented as called for in the Contract Documents.

§4.2.4.2 Any communications between the Architect and Subcontractors shall be confirmed in writing to the Contractor.

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

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

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken

in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable Documents or the bidding requirements, the Contractor, within twenty (20) days after award of the Contract, shall notify the Owner Owner, Owner's Representative, and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or Owner's Representative or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§5.2.1.1 The Architect shall respond in writing even if the Owner or the Architect has no objections to any Subcontractor or Sub-subcontractor. Work shall not be started until all objections have been resolved in writing.

§5.2.1.2 If requested, the Contractor shall furnish evidence satisfactory to the Architect showing each proposed Subcontractor or Sub-subcontractor is competent to execute the Work covered by its contract.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection. **See USDA Attachment 4 for revision.**

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

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

§ 5.2.5 Upon request, Contractor shall provide Owner an executed copy of any and all subcontracts, purchase orders, and other agreement relating to the Work.

§ 5.3 Subcontractual Relations

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

§ 5.3.1 The Contractor shall include a provision in each subcontract making the Owner as intended beneficiary of each subcontract agreement.

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the ~~suspension~~ suspension and not due to any breach of contract or negligence of Subcontractor.

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

§5.4.4 Any assignment made under this section shall not relieve Contractor of its duties and responsibilities under the Contract nor shall any assignment be deemed a waiver by the Owner of any action or claims which it could assert against the Contractor.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

§ 6.1.1.1 If applicable, the Contractor shall be responsible for the installation of certain equipment furnished by the Owner as indicated in the Contract documents. It shall be the Contractor's responsibility to receive, unload, store, protect, set in place and connect each piece of equipment. Any equipment damaged or lost after receipt by the Contractor shall be replaced or repaired by the Contractor, or to the extent such a loss is covered by the Builders Risk Policy, Contractor shall pay the deductible. The Contractor shall forward a Receiving Notice to the Owner and the Architect the same day such equipment is received. The Receiving Notice shall be in sufficient detail to allow the Owner and the Architect to match the receiving Notice to the Purchase Order and Vendor Invoice.

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

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

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

§ 6.1.5 The Owner shall not assign to the Contractor any separate contracts whose terms with respect to payment applications, insurance, damages, and excusable delay materially differ from those contained in the Agreement.

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, only by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. See USDA Attachment 4 for revision.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone. See USDA Attachment 4 for revision.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the ~~Change Order~~, Construction Order, Construction Change Directive, or order for a minor change in the Work. See USDA Attachment 4 for revision.

§ 7.1.4 Except as permitted by Section 7.3, a change to the Contract Sum and the Contract Time shall only be accomplished by a Change Order. No course of dealing, express or implied contract, estoppel, waiver, or claim of unjust enrichment or quantum meruit shall be the basis of any claim to an increase in the Contract Sum or the Contract Time.

§ 7.2 Change Orders

§ 7.2.1 See USDA Attachment 4 for revision.

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

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

§ 7.2.2 See USDA Attachment 4 for revision.

§ 7.2.3 The Change Order shall represent a complete accord and satisfaction and settlement of all claims relating to the Work relating to the Change Order including without limitation all direct and indirect costs associated including without limitation cumulative impacts and other claims for any increase in the Contract Time or the Contract Sum. Such agreement on any Change Order, even where the Contractor attempts to reserve any rights, constitutes a full, final, and complete waiver, release, and settlement of any and all claims, demands, and causes of action the Contractor has, or may have in the future, arising out of or relating to the Change Order and the occurrences, acts, omissions, or events upon which the Change Order is based.

§ 7.2.4 The Contract Sum or Contract Time shall only be modified by a written Change Order under this section, by a Construction Change Directive under section 7.3. No course of dealing, conduct between the parties, or any asserted implied acceptance of alterations or additions to the Work or any asserted enrichment or benefit conferred upon the Owner shall constitute the basis for any Claim for modification to the Contract Sum or Contract Time or any modification to any term of the Contract Documents.

7.2.5 The Contractor shall submit detailed requests for Change Orders within 21 calendar days of issuance of a response to a Contractor issued RFI or to an Architect issued ASI, RFP, or any other event that the Contractor believes will result in a Change Order. If such request is not received within the time period, the Contractor waives the right to any change in Contract time or amount.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly. **See USDA Attachment 4 for revision.**

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order. **See USDA Attachment 4 for revision.**

§ 7.3.3 See USDA Attachment 4 for revision.

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

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

§ 7.3.4 See USDA Attachment 4 for revision.

If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, ~~Agreement~~ (subject to Section 7.3.11), or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.4.1 The Owner, the Owner's Representative, and the Architect shall have the right to audit the Contractor's records to verify the costs of the changed work for which Contractor is being paid on a Cost Plus basis.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15. **See USDA Attachment 4 for revision.**

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time. **See USDA Attachment 4 for revision.**

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order. **See USDA Attachment 4 for revision.**

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change. **See USDA Attachment 4 for revision.**

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

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive. **See USDA Attachment 4 for revision.**

§ 7.3.11 Absent other agreement by the parties, the combined overhead and fee in change orders shall be computed on the following basis:

- .1** Fee as defined in this Agreement.
- .2** In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs, including labor, materials, and subcontractors. Labor and materials shall be itemized in the manner prescribed above. Where major items are Subcontracts, they shall be itemized also. In no case will a change involving over \$5,000.00 be approved without such itemization.
- .3** No additional overhead will be paid for Work that the Owner does not believe will extend the Contract Time.

§ 7.4 Minor Changes in the Work

The Architect and Owner's Representative may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order orders for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Owner's Representative and Architect and shall not proceed to implement the change in the Work. If the Contractor performs

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the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

§ 7.5 Construction Contingency

The GMP includes a contingency amount which may be used to address unforeseen increases in the Cost of the Work due to factors that are not eligible for a Change Order, but are outside of the Contractor's reasonable control. The Contractor may only use Construction Contingency funds after obtaining the Owner's prior written approval to cover a legitimate unforeseen cost. The Contractor understands and agrees that Construction Contingency funds may not be used for: (1) costs of rework required as a result of errors in the performance of the Work; (2) increases in the Cost of the Work caused by a lack of coordination or communication with or among the Owner's Project team members, including but not limited to Owner, Architect, Owner's Representative, Special Inspectors, Commissioning Agent, FF&E vendors, Transition and Move contractors, etc.; (3) increases in the Cost of the Work caused by errors or omissions in the Contractor's cost estimate or any trade subcontractor's cost estimate; (4) increases in the Cost of the Work caused by a lack of coordination or communication with or among the Contractor's trade subcontractors or material and equipment suppliers; or (5) increases in the Cost of the Work required to correct errors or omissions in the Contract Documents, which error or omission the Contractor had a responsibility to identify and seek to correct at an earlier stage of the Project or that the Contractor should have reasonably inferred based on its experience on prior projects.

The Contractor may use Construction Contingency funds to the extent available and approved by Owner in its sole discretion, to cover unanticipated or unforeseen price increases in supplies or materials.

Unforeseen site conditions and/or constructability issues will be evaluated on a case-by-case basis with the Owner's Project team for an allocation of Construction Contingency funds or modification by Change Order to increase the Contract Sum.

Notwithstanding anything in these General Conditions or the Agreement to the contrary, the Construction Manager's contingency shall not be used: (i) to cover any cost or expense caused or allowed by the Construction Manager's negligence, intentionally wrongful conduct, or breach of Agreement, (ii) to pay for any of the Construction Manager's responsibilities related to general conditions/construction support items, or (iii) in a manner that is contrary to law.

In the event there are unexpended Construction Contingency funds at Final Completion or any other savings, all such unexpended Construction Contingency funds and savings shall be returned 100% to the Owner without any split.

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.1.5 "Float" is the difference in duration between the late finish and early finish dates of an activity.

§ 8.1.6 "Construction Contingency" shall have the meaning set forth in Section 3.2.4 of the Agreement, as modified by Section 7.5 of these General Conditions.

§ 8.2 Progress and Completion

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

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

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

§ 8.2.4 See USDA Attachment 4 for revision.

§ 8.3 Delays and Extensions of Time

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

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

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

§ 8.3.4 See USDA Attachment 4 for revision.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.2.1 The Schedule of Values and the Application for Payment shall indicate each subcontract amount for each part of the Work with the Contractor's fee listed separately for work performed on a Cost Plus basis.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, ~~such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and or Owner's Representative~~ require, including, all in form and substance satisfactory to the Owner: (i) a current Contractor's lien waiver with a duly executed and acknowledged sworn statement showing the amount requested for any Subcontractor and material supplier in the requested progress payment, and the amount to be paid to such subcontractor or material supplier from such progress payment, together with similar sworn statements from all such Subcontractors and material suppliers; (ii) duly executed conditional waivers of mechanics' and material suppliers' liens from all Subcontractors and, when

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appropriate, from material suppliers and lower tier Subcontractors, and establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or persons in any previous Application for Payment; and (iii) all information and materials required to comply with the requirements of the Contract Documents or reasonably requested. The Application for Payment shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders. **See USDA Attachment 4 for revision.**

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

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner ~~shall, to the best of the Contractor's knowledge, information, and belief, shall~~ be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work. In the event a lien is recorded by anyone in relation to the Work for which the Owner has paid the Contractor, the Owner shall have the right to : (1) require Contractor to have the lien discharged by posting a bond with appropriate surety within five (5) calendar days of written notice by Owner to Contractor; or (2) retain from any payment due Contractor or to become due Contractor, an amount sufficient to indemnify Owner against said lien or claim of lien, including bond premiums and attorney's fees, and to apply same in such manner as Owner deems necessary to secure protection and/or satisfy such claims and liens. In the event such lien is not discharged, Owner shall have the right to terminate the Agreement for cause or to bond off said lien(s) and recover from Contractor all costs incurred as a result of termination, including, without limitation, bond premiums, and attorney's fees, unless the recording of the lien was a result of the non-payment by the owner.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. **See USDA Attachment 4 for revision.**

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

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or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

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

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

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

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

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

§ 9.6 Progress Payments

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

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. With each succeeding Application for Payment, Contractor shall include Unconditional Waivers of Lien and Sworn Statements from each Subcontractor acknowledging payment of the amounts shown on the previous Application for Payment.

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner If a Subcontractor or material or equipment supplier has not been paid and no condition exists by which the Contractor may withhold payment pursuant to the

terms of the subcontract or purchase order, the Owner and the Owner's Representative has the right, but not the obligation, to pay the Subcontractor or material or equipment supplier directly and deduct the cost from the amount owed to the Contractor, or to issue joint checks to the Subcontractor or material or equipment supplier with the Contractor. Neither the Owner, Owner's Representative, nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

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

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

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

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

§ 9.6.9 See USDA Attachment 4 for revision.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by ~~binding dispute resolution, a court,~~ then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents. **See USDA Attachment 4 for revision.**

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. As used herein, the Owner's "intended use" of the Work includes Owner's ability to occupy and utilize all common areas and amenities for their intended purposes without unscheduled interruptions or interference. Under no circumstances shall the Work or any portion thereof be deemed to be substantially complete unless and until certificates of occupancy and completion governing the Project have been issued by all appropriate governmental authorities having jurisdiction over the Project thereby allowing the intended use of the Work.

§ 9.8.1.1 The Work will not be considered suitable for Substantial Completion review until all Project systems included in the Work are operational as designed and scheduled, all designated or required governmental inspections and certifications, including certificates of occupancy, have been made and posted, designated instruction of the Owner's personnel and the operation of systems and equipment completed, and all final finishes within the Contract Documents are in place. In general, the only remaining Work shall be minor in nature, so that the Owner can occupy the building on that date for its intended use and the completion of the Work the Contractor would not materially affect, interfere, or hamper the normal business operations or intended use of Owner. As a further condition of Substantial Completion, acceptance and/or certification, the Contractor shall certify that all remaining Work will be completed within thirty (30) calendar days or as agreed upon following the date of Substantial Completion.

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

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

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

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents. **See USDA Attachment 4 for revision.**

§9.8.5.1 If the initial inspection requested by the Contractor to establish Substantial Completion or Final Completion determines that Substantial Completion or Final Completion has not been achieved, the Contractor shall pay for time and expenses for additional reinspections incurred by the Architect and the Architect's Consultants at no expense to the Owner.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect. **See USDA Attachment 4 for revision.**

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

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents. **See USDA Attachment 4 for revision.**

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance receipt of all Project Close Out documentation, and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the

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Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.1.1 Final payment to the Contractor will not be made until all guarantees, warranties, operating manuals, parts, list, instructions, and record (as-built) drawings have been received by the Owner.

§ 9.10.1.2 The Owner and the Owner's Representative shall have the right to require an audit of the Contractor's records. The audit shall be conducted by the Owner, the Owner's Representative, or an authorized representative. The Owner and the Owner's Representative reserve the right to audit at any time during construction and within one year after the Final Completion of the Work, unless a longer period is required by a grant or other funding source.

§ 9.10.2 Neither In addition to any other requirements for final payment, or release of retainage in the Contract Documents or applicable law, neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and full conditional waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. by the Owner, (6) assignments of and all information on all warranties and guarantees relating to the Work, (7) all required approvals by any governmental entity or agency, and (9) any other items required in the Construction or Contract Documents. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees. Full unconditional lien waivers shall be provided by the Construction Manager upon final payment to each subcontractor and shall be provided to the owner. The Construction Manager shall not be required to pay subcontractors in full until final payment is received from the owner.

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

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

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

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

§9.10.6 Final Affidavits and Waivers of Liens, Contractor will submit to Architect and Owner final affidavits and waivers of liens, in form and substance satisfactory to Owner and Architect, from Contractor and all Subcontractors, Sub-subcontractors, and material suppliers at Final Completion of the Work. On request of the Owner, Contractor will provide any additional information or documentation necessary under the then existing mechanic's lien laws.

§9.10.7 Final completion of the Project shall be achieved no later than 30 days following the date of Substantial Completion. If final completion of the Project is not achieved within 30 days of date of Substantial Completion, the Contractor shall pay the professional time and expenses of the Architect and Architect's Consultants until final completion is achieved.

§ 9.10.8 After Contractor's acceptance of final payment, in the event a lien is filed against the Project in connection with any work by Contractor or its Subcontractors or suppliers, the Contractor shall satisfy such claim within ten (10) days from the filing date. In the event Contractor fails to satisfy such lien claim within such ten (10) day period, the Owner may do so and thereafter charge the Contractor all costs incurred by Owner in connection with the satisfaction of such lien, including attorneys' fees. In addition, the Contractor shall indemnify, defend and hold Owner harmless from and against any damage or loss incurred by Owner as a result of such lien or claim.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the ~~Contract~~ Contract, including those required by the OSHA standards.

§ 10.1.1 The Contractor shall be responsible for the safety of individuals, whether employed by the Contractor or not, on the Project site. The Contractor shall comply with all applicable local, state, or federal laws and regulations regarding safety. If either the Owner or the Owner's Representative has employed a specific Safety Plan at the time of entering this Agreement, the Contractor shall meet all requirements of the Safety Plan during its performance of the Work.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall be responsible to the Owner for overall jobsite safety and shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

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

§ 10.2.1.1 The Contractor shall promptly remedy damage and loss to property to the extent caused in whole or in part by the negligence of the Contractor, or by anyone for whose acts the Contractor may be responsible.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss. The Contractor shall ensure that all its employees, subcontractors and vendors take reasonable precautions to avoid the spread of infectious diseases and comply with all personal protective equipment, vaccination (only for Contractor's employees or subcontractors or vendors making site visits to the Owner's existing hospital campus), and other requirements issued by the Owner or any public authority having jurisdiction over the Project, as the same may be amended from time to time.

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

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

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

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

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition. When required by law or for the safety of the Work and existing structures, the Contractor shall shore-up, brace, underpin, and protect foundations and other portions of existing structures which are in any way affected by the Work. The Contractor, before commencement of any part of the Work, shall give any notices required to be given to adjoining landowners or other parties.

§ 10.2.8 Injury or Damage to Person or Property

~~If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.~~

§ 10.2.8 The Owner, the Owner's Representative, and the Contractor acknowledge and agree that the obligations of Contractor related to protection of persons and property are obligations that run to the Owner and the Owner's Representative only. Contractor shall remain the controlling contractor for Work performed by its own forces, but assumes no duty of care to employees of Subcontractors, sub-subcontractors and suppliers or employees or agents of any of them as they are independent contractors. Contractor shall require each of its Subcontractors to initiate, maintain and supervise all safety precautions and programs in connection with the performance of their respective work. Subcontractors are solely responsible to the Owner, the Owner's Representative, and Contractor for, and have control over, its construction means, methods and techniques, including safety programs and procedures related thereto. Contractor is not the insurer of safety for everyone on the Project, but rather each Subcontractor, as experts in their specific fields or line of work, are in the best position to implement programs and procedures that will ensure the safety of those performing its work. The obligations of Contractor herein are for the purpose of protecting the Owner and the Owner's Representative and to promote safety without exposing Contractor to suits by workers employed by its Subcontractor, sub-subcontractor and suppliers or anyone directly or indirectly employed by any of them or anyone for whose acts they may be liable.

§ 10.2.9 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the ~~Owner~~ Owner, Owner's Representative and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of ~~a licensed laboratory an environmental consulting firm~~ to verify the presence or absence of the material or substance reported by the Contractor and not introduced by Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 ~~To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.~~ The Contractor agrees that: (1) no hazardous substances, wastes or materials (collectively "hazardous materials") will be brought onto the site by Contractor, any Subcontractor, Sub-subcontractor, materialman or supplier, or any person or entity for whom any of them is responsible, except as required by the Contract Documents or otherwise required for the Work and in full compliance with applicable laws, (2) no asbestos-containing material, lead-based paint or other hazardous materials will be incorporated into the Work, and (3) without Owner's prior written consent, no underground or above-ground storage tanks will be placed on the site. In the event any suspected hazardous materials are encountered at the site during the conduct of the Work, Contractor shall: (a) stop the Work in the area where suspected hazardous materials are encountered until receipt of notification from Owner that Work shall proceed, (b) promptly notify Owner of such encounter and consult with Owner, and (c) take all reasonable precautions in accordance with applicable law to prevent or contain the movement, spread or disturbance of such hazardous materials and to protect all persons and property. To the fullest extent allowed by law, the Contractor shall indemnify and hold harmless Owner for any liability, damages and expenses, including attorneys' fees, resulting from any breach of this Paragraph 10.3.3.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 ~~If, without negligence on the part of the Contractor, or breach of Contract on the part of the Contractor or its Subcontractors or Sub-subcontractors at any level, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.~~

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

§10.5 By the date of Substantial Completion, the Contractor shall provide Owner with an affidavit notarized by a notary public which certifies that no PCB's or asbestos have been used in the materials for construction of the Project provided that such materials are not specified in the Contract Documents.

§10.6 By the date of Substantial Completion, the Contractor shall provide Owner with an affidavit notarized by a notary public which certifies that all materials containing Volatile Organic Compounds (VOC) are in strict compliance with all VOC requirements and regulations of the Environmental Protection Agency (EPA), Occupational Safety Health Administration (OSHA), State, County, City and Local Air Control District.

§10.7 By the date of Substantial Completion, the Contractor shall provide Owner with an affidavit notarized by a notary public which certifies that all hazardous waste, trash, debris, etc. have been disposed of in a manner which is in strict compliance with all current requirements of EPA, State, County, City and Local districts or authorities

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents. **See USDA Attachment 4 for revision.**

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, and ensure the bonds remain valid until Final Completion. **See USDA Attachment 4 for revision.**

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.3.1 See USDA Attachment 4 for revision.

§ 11.1.3.2 See USDA Attachment 4 for revision.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

~~§ 11.2.2 Failure to Purchase Required Property Insurance.~~ ~~If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and~~

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Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and ~~Architect's~~ Owner's Representatives and their consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the ~~Architect, Architect's Architect and Owner's Representatives, and their consultants~~, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property. **See USDA Attachment 4 for revision.**

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

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

§ 11.5 Adjustment and Settlement of Insured Loss

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

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the ~~Contractor and to make a claim for breach of warranty.~~ Contractor, but not any other remedy, provided that the Contractor is notified of such remedy. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5. Contractor shall provide all labor, engineering, supervision, equipment, tools and material necessary to effect the remedy and shall bear all of the Contractor's expenses in connection therewith. The cost of all Work incidental to such remedy, including the removal, replacements or installation of confirming Work or materials or equipment, and the cost of transporting repaired items to and from the Project site, shall be borne solely by the Contractor, as required by the Contract Documents. Contractor shall also, with no increase in the Contract Sum, perform such tests required by the Contract Documents to verify that corrected or reperformed Work or the repaired, replaced, or modified item of materials or equipment conforms to the above requirement. Contractor shall perform such Work in a timely manner, consistent with the Owner's reasonable requirements. The period for the correction of Work shall be extended by corrective Work performed by the Contractor. It is acknowledged that this provision applies to only warranty work and not "punch list" work which may have not been addressed in the original project inspection. Also, this provision does not apply to items which are not operating properly due to negligence or a lack of standard maintenance by the owner.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 ~~The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.~~ Defective work corrected by the Contractor shall be warranted for an additional period of one (1) year from the date of the Owner's acceptance of the Contractor's corrections.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Documents, or other rights the Owner may have to assert claims against the Contractor, including but not limited to claims for defective work or breach of contract. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, ~~excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.~~ located. If any provision of the Contract Documents is found to be invalid, illegal or unenforceable for any reason, that shall not affect or impair the validity or enforceability of any other provision or of the Contract Documents as a whole. The particular provision found to be invalid, illegal or unenforceable shall be modified in such a way to make the provision valid and enforceable and to provide the greatest protection to the Owner to the fullest extent allowed under the applicable laws.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. Documents, but only after the lender has assumed control of the Project and then only to the extent of the lender's interest in the Project. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Owner's Representative, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

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

§ 13.4.2 If the Architect, Owner's Representative, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Owner's Representative and Architect of when and where tests and inspections are to be made so that the Owner's Representative and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's ~~expense~~ expense unless the Contractor should have reasonably anticipated such tests, inspections or approvals based on its required standard of care in the Agreement.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Owner's Representative or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Owner's Representative or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.6 Lands and Rights-of-Way See USDA Attachment 4 for revision.

§ 13.7 Equal Opportunity Requirements-- See USDA Attachment 4 for revision.

§ 13.7.4 Application -- See USDA Attachment 4 for revision.

§ 13.8 Statutes -- See USDA Attachment 4 for revision.

§ 13.9 Records-- See USDA Attachment 4 for revision.

§ 13.10 Environmental Requirements -- See USDA Attachment 4 for revision.

§ 13.11 Debarment and Suspension-- See USDA Attachment 4 for revision.

§ 13.12 Compliance with Law

Contractor shall comply, and cause those performing or supplying any part of the Work to comply, with all federal, state, and local laws applicable to the Work.

§ 13.13 Domestic Preference: Iron and steel products, Manufactured Products, and Construction Materials used in this project comply with the Build America, Buy America Act (BABAA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. 177.58.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 ~~The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.~~

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such ~~termination~~ termination only the amount confirmed by Owner's audit as full and final compensation.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 ~~repeatedly~~ refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 ~~repeatedly~~ disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of ~~substantial material breach~~ of a provision of the Contract Documents; Documents;
- .5 ~~becomes insolvent or otherwise takes or is subjected to action evidencing insolvency; or~~
- .6 ~~fails or refuses to provide insurance or proof of insurance as required by the Contract Documents~~

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

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

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. In the event Owner is determined to have incorrectly terminated the Contractor for Cause, such termination shall be deemed to have been a termination for convenience and shall be governed by the provisions of Paragraph 14.4.

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly ~~executed; executed and fee;~~ costs incurred by reason of the ~~termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.~~ termination only the amount verified by Owner's audit as full and final compensation.

§ 14.4.4 In no event shall Owner be liable to Contractor for unrealized profits on the terminated Work. Contractor's invoice for compensation in the event of termination must be supported by sufficient records and documentation to enable Owner to verify all amounts claimed by Contractor. Upon termination pursuant to this Paragraph, Owner shall have no further obligation to Contractor with respect to the terminated portion(s) of the Work.

§ 14.4.5 In the event that the Owner terminates the Contractor for Cause pursuant to Section 14.2 and there is a later determination that Cause did not exist, the termination by the Owner will be deemed to have been a termination for Convenience under Section 14.4.

§ 14.4.6 For the avoidance of doubt, the parties understand and agree that the Owner's right to terminate for convenience, as set forth hereunder, shall not be extinguished notwithstanding any early package work that may be executed separately.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, ~~but in any case not more than 10 years after the date of Substantial Completion of the Work~~ law. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, ~~notice as provided in Section 15.1.3 shall be given.~~ the Contractor shall provide timely written notice containing the information required by the Contract Documents. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary: analysis using only a properly implemented Time Impact Analysis, Window Analysis or legally sufficient equivalent demonstrating the effect of the Claim on the critical path of the overall Project. The analysis shall include, without limitation, an identification and quantification of the delay resulting from the Claim, the measures that are or have been taken to mitigate the effect of any Claim, any other proposal or possibility to reduce or eliminate the effect of the Claim. No adjustments to the Contract Time shall be permitted for any delay to the extent caused by the Contractor. The Contractor expressly agrees that delays to construction activities which do not affect the overall completion of the Work shall not entitle the Contractor to an adjustment of the Contract Time.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of ~~time,~~ time at the project location, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

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

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand ~~mediation and binding dispute resolution~~ non-binding mediation without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker ~~may, but shall not be obligated to,~~ consult with or seek information from ~~either party or from both parties~~ and persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data

will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution. **See USDA Attachment 4 for revision.**

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution. If such matter relates to or is the subject of a lien arising out of the Contractor's services, the Contractor may proceed in accordance with applicable law to comply with the lien notice or filing deadlines prior to resolution of the matter by mediation or by binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. ~~If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.~~ **See USDA Attachment 4 for revision.**

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the

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Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.1.2 See USDA Attachment 4 for revision.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

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

§ 15.4.4 Consolidation or Joinder

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

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

ATTACHMENT TO AIA DOCUMENT A201-2017, *General Conditions of the Contract for Construction*

The provisions of this attachment shall delete, modify and supplement the provisions contained in the "*General Conditions of the Contract for Construction*," AIA Document A201-2017 Edition. The provisions contained in this attachment will supersede any conflicting provisions of the AIA Document. The term "Agency," as used in this Attachment, shall mean the United States of America, acting through the United States Department of Agriculture.

ARTICLE 1, GENERAL PROVISIONS

Add the following subparagraph:

1.2.4 Concurrence of the Contract by the Agency is required before it is effective.

ARTICLE 2, OWNER

Delete subparagraph 2.3.6 and substitute the following:

2.3.6 The Contractor will be furnished, free of charge, _____ copies of the Drawings and Projects Manuals necessary for execution of the Work. Additional copies will be available from the Architect at the cost of reproduction and handling.

ARTICLE 4, ARCHITECT

Add the following to subparagraph 4.1.1:

The term "Architect" means the Architect, or the Engineer when the nature of the work is within the authority granted engineers by the State licensure law, or an authorized representative of the Architect or Engineer.

ARTICLE 5, SUBCONTRACTORS

Add the following to subparagraph 5.2.2:

The Contractor shall not contract with any party who is suspended or debarred by any Federal government agency from participating in Federally assisted construction projects.

ARTICLE 7, CHANGES IN THE WORK

Delete the words ", Construction Change Directive" from subparagraph 7.1.1.

Insert the words ", Agency " after the word "Owner," and delete the words "A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor" in subparagraph 7.1.2.

Delete the words "Construction Change Directive" from subparagraph 7.1.3.

Delete subparagraph 7.2.1 and substitute the following:

7.2.1 A Change Order is a written order to the Contractor utilizing Form RD 1924-7, "Contract Change Order," or AIA G-701 signed by the Owner, Architect, Contractor, and the Agency representative. It is issued after the execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. The Contractor's signing of a Change Order indicates complete agreement therein.

Add subparagraph 7.2.2:

7.2.2 Methods used in determining adjustments to the Contract Sum may include any of the following:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluating.
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon.

Add the following sentence to paragraph 7.3.1: "A Construction Change Directive may be used only for a change in response to an emergency as described in paragraph 10.4.

Delete subparagraph 7.3.2.

Add the following, where appropriate, to 7.3.3 through 7.3.10:
"When the use of a Construction Change Directive is justified"

ARTICLE 8, TIME

Add the following subparagraphs:

8.2.4 The Notice to Proceed shall be issued within twenty (20) calendar days of the execution of the Agreement by the Owner. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement of the Owner and Contractor, with the concurrence of the Agency. If the Notice to Proceed has not been issued within the twenty (20) calendar day period or within the period mutually agreed, the Contractor may terminate the Agreement without further liability on the part of either party.

8.3.4 As outlined in Article 3 of the Agreement, the Contractor agrees to pay liquidated damages to the Owner for each calendar day the Contractor shall be in default.

ARTICLE 9, PAYMENTS AND COMPLETION

Delete clause 9.3.1.1 and substitute the following:

9.3.1.1 Work performed and materials supplied under a Change Order may be included for payment only after the Change Order has been approved by all appropriate parties, including the Agency.

Add the words ", using AIA Document 702, 'Application and Certificate for Payment' or Form RD 1924-18, 'Partial Payment Estimate'," after "Certificate for Payment" in subparagraph 9.4.1.

Add the following subparagraph:

9.6.9 No progress payments will be made that deplete the retainage, nor place in escrow any funds that are required for retainage, nor invest the retainage for the benefit of the Contractor. Retainage will not be adjusted until after construction is substantially complete.

Replace the word "seven" with the words "fifteen (15)" in the first sentence, second line of subparagraph 9.7.

Delete subparagraph 9.8.5, after the first sentence, and substitute the following:

9.8.5 When the Work has been substantially completed, except for Work which cannot be completed because of weather conditions, lack of materials or other reasons, which, in the judgment of the Owner, are valid reasons for non-completion, the Owner may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the Work still to be completed. Provide a copy of the Certificate to the Agency.

Delete subparagraphs 9.9.1 and add the following:

9.9.1 The Contractor agrees to the use and occupancy of a portion or unit of the Project before formal acceptance by the Owner under the following conditions:

- .1 A "Certificate of Substantial Completion" shall be prepared and executed as provided in subparagraph 9.8.4, except that when, in the opinion of the Architect, the Contractor is chargeable with unwarranted delay in completing the Work or other Contract requirements, the signature of the Contractor will not be required. The Certificate of Substantial Completion shall be accompanied by a written endorsement of the Contractor's insurance carrier and surety permitting occupancy by the Owner during the remaining period of the Project Work. Occupancy and use by the Owner shall not commence until authorized by public authorities having jurisdiction over the Work.
- .2 Occupancy by the Owner shall not be construed by the Contractor as being an acceptance of that part of the Project to be occupied.
- .3 The Contractor shall not be held responsible for any damage to the occupied part of the Project resulting from the Owner's occupancy.
- .4 Occupancy by the Owner shall not be deemed to constitute a waiver of existing claims in behalf of the Owner or Contractor against each other.
- .5 If the Project consists of more than one building, and one of the buildings is to be

occupied, the Owner, prior to occupancy of that building, shall secure permanent property insurance on the building to be occupied and necessary permits which may be required for use and occupancy.

Add to subparagraph 9.9.3: Use and occupancy by the Owner prior to Project acceptance does not relieve the Contractor of responsibility to maintain all insurance and bonds required of the Contractor under the Contract Documents until the Project is completed and accepted by the Owner.

ARTICLE 11, INSURANCE AND BONDS

Replace the words "the Contract Documents" with the words "subparagraph 11.1.1" in the first sentence of subparagraph 11.1.2.

Add the following subparagraph:

11.1.1. Insurance shall be:

- .1 Written with a limit of liability of not less than \$500,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; and a limit of liability of not less than \$500,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than \$200,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than \$200,000 aggregate for any such damage sustained by two or more persons in any one accident, or
- .2 Written with a combined bodily injury and damage liability of not less than \$700,000 per occurrence; and with an aggregate of not less than \$700,000 per occurrence.

Add the following sentence to the end of subparagraph 11.3.1:

The provisions of this subparagraph shall apply to the Contractor if the Contractor purchases and maintains said insurance coverage.

Delete subparagraph 11.1.2 and substitute the following:

11.1.2 The Contractor shall furnish the Owner bonds covering faithful performance of the Contract and payment of obligations arising thereunder within ten (10) calendar days after receipt of the Notice of Award. The surety company executing the bonds must hold a certificate of authority as an acceptable surety on Federal bonds as listed in Treasury Circular 570, and be authorized to transact business in the State where the Project is located. The bonds (using the forms included in the Bidding Documents) shall each be equal to the amount of the Contract Sum. The cost of these bonds shall be included in the Contract Sum

Add the following subparagraphs:

11.1.3.1 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current power of attorney.

11.1.3.2 If at any time a surety on any such bond is declared bankrupt or loses its right to do business in the State in which the work is to be performed or is removed from the list of surety companies accepted on Federal Bonds, the Contractor shall within ten (10) calendar days after notice from the Owner to do so, substitute an acceptable bond in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums of such bond shall be paid by any Contractor. No further payment shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to the Owner.

ARTICLE 13, MISCELLANEOUS PROVISIONS

Add the following paragraphs:

13.6 LANDS AND RIGHTS-OF WAY

13.6.1 Prior to the start of construction, the Owner shall obtain all lands and rights-of-way necessary for the execution and completion of work to be performed under this contract.

13.7 EQUAL OPPORTUNITY REQUIREMENTS

Non-discrimination in Employment by Federally Assisted Construction Contractors, by Executive Order 11246.

13.7.1 This section summarizes Executive Order 11246, which prohibits employment discrimination and requires employers holding non-exempt Federal contracts and subcontracts and federally-assisted construction contracts and subcontracts in excess of \$10,000 to take affirmative action to ensure equal employment opportunity without regard to race, color, religion, sex, or national origin. The Executive Order requires, as a condition for the approval of any federally assisted construction contract, that the applicant incorporate nondiscrimination and affirmative action clauses into its non-exempt federally assisted construction contracts.

13.7.2 Executive Order 11246, is administered and enforced by the Office of Federal Contract Compliance Programs (OFCCP), an agency in the U.S. Department of Labor's Employment Standards Administration. OFCCP has issued regulations at 41 CFR chapter 60 implementing the Executive Order. The regulations at 41 CFR part 60-4 establish the procedures which the Agency, as an administering agency, must follow when making grants, contracts, loans, insurance or guarantees involving federally assisted construction which is not exempt from the requirements of Executive Order 11246. The regulations which apply to Federal or federally assisted construction contractors also are published at 41 CFR part 60-4.

13.7.3 OFCCP has established numerical goals for minority and female utilization in construction work. The goals are expressed in percentage terms for the contractor's aggregate workforce in each trade. OFCCP has set goals for minority utilization based on the percentage of minorities in the civilian labor force in the relevant area. There is

a single nationwide goal of 6.9 percent for utilization of women. The goals apply to all construction work in the covered geographic area, whether or not it is federal, federally assisted or non-federal. A notice advises bidders of the applicable goals for the area where the project is to be located.

13.7.4 Application. This section applies to all of a construction contractor's or subcontractor's employees who are engaged in on-site construction including those construction employees who work on a non-Federal or non-Federally assisted construction site.

13.7.4.1 Agency officials will notify the appropriate Regional Director of OFCCP that an Agency financed construction contract has been awarded, and that the equal opportunity clauses are included in the contract documents.

13.7.4.2 The Regional Director, OFCCP-DOL, will enforce the non-discrimination requirements of Executive Order 11246.

13.7.5 The prospective contractor or subcontractor must comply with the Immigration Reform and Control Act of 1986, by completing and retaining Form I-9, "Employment Eligibility Verification," for employees hired. This form is available from the Immigration and Naturalization Service, and Department of Justice.

13.7.6 The prospective contractor or subcontractor must submit Form RD 400-6, "Compliance Statement," to the applicant and an Agency official as part of the bid package, prior to any contract bid negotiations and comply with the Executive Order 11246 as stated in the contract documents.

13.8 STATUTES

13.8.1 The Contractor and each Subcontractor shall comply with the following statutes (and with regulations issued pursuant thereto, which are incorporated herein by reference):

13.8.1.1 Copeland Anti-Kickback Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR part 3). This Act provides that each Contractor shall be prohibited from inducing, by any means, any person in connection with construction to give up any part of the compensation to which the person is otherwise entitled.

13.8.1.2 Clean Air Act (42 U.S.C. 7414), section 114, and Water Pollution Control Act (33 U.S.C. 1813), section 308. Under Executive Order 11738 and Environmental Protection Agency (EPA) regulations 40 C.F.R. part 15, all Contracts in excess of \$100,000 are required to comply with these Acts. The Acts require the Contractor to:

- .1 Notify the Owner of the receipt of any communication from EPA indicating that a facility to be utilized in the performance of the Contract is under consideration to be listed on the EPA list of Violating Facilities.
- .2 Certify that any facility to be utilized in the performance of any nonexempt Contractor or Subcontractor is not listed on the EPA list of Violating Facilities as of the date of the Contract Award.
- .3 Include or cause to be included the above criteria and requirements of paragraphs .1 and .2 in every nonexempt subcontract, and that the Contractor will take such action as the Government may direct as a means of enforcing such provisions.

13.8.1.3 Restrictions on Lobbying (Public Law 101-121, section 319) as supplemented in Department of Agriculture regulations (7 CFR part 3018). This statute applies to the recipients of contracts or subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, the Contractor must complete a certification form on lobbying activities related to the specific Federal loan or grant that is a funding source for this contract. The certification and disclosure forms shall be provided by the Owner.

13.9 RECORDS

13.9.1 If the Contract is based on a negotiated Bid, the Owner, the Agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor which are pertinent to a specific Federal loan program for the purpose of making audit, examination, excerpts, and transcriptions. The Contractor shall maintain records for at least three years after the Owner makes final payment and all other pending matters are closed.

13.10 ENVIRONMENTAL REQUIREMENTS

13.10.1 Mitigation Measures - The contractor shall comply with applicable mitigation measures established in the environmental assessment for the project. These may be obtained from the Agency representative.

13.10.2 The Contractor, when constructing a Project involving trenching, excavating, or other earth moving activity, shall comply with the following environmental constraints:

13.10.2.1 Endangered Species, Historic Preservation, Human Remains and Cultural Items, Hazardous Materials, and Paleontology - Any excavation or other earth moving activity by the Contractor that provides evidence of the presence of endangered or threatened species or their critical habitat, uncovers a historical or archaeological artifact, human remains or cultural items, hazardous materials, a fossil or other paleontological materials will require the Contractor to:

- .1 Temporarily stop work;
- .2 Provide immediate notice to the Architect and the Agency, and in the case of potentially hazardous materials, provide immediate notice to local first responders and take such measures as necessary to protect the public and workers;
- .3 Take reasonable measures as necessary to protect the discovered materials or protected resource;
- .4 Abide by such direction as provided by the Agency, or Agencies responsible for resource protection or hazardous materials management; and
- .5 Resume work only upon notice from the Architect and the Agency.

13.10.3 Lead-Based Paint - The Contractor and Owner shall comply with applicable Agency requirements of the Lead-Based Paint Poisoning Prevention Act, as amended (42 U.S.C. 4821), and the Residential Lead-Based Paint Hazard Reduction Act of 1992 (42 U.S.C. 4851) for rehabilitation work on residential property built prior to 1978.

13.11 DEBARMENT AND SUSPENSION

13.11.1 The Contractor shall comply with the requirements of 7 CFR part 3017, which pertains to the debarment or suspension of a person from participating in a Federal program or activity.

ARTICLE 15 CLAIMS AND DISPUTES

Add the words "may be" after "on the parties but" in the last sentence of subparagraph 15.2.5.

Replace the word "shall" with the word "may" in the first sentence, first occurrence of subparagraph 15.3.2

Add the subparagraph: 15.4.1.2 The arbitrators will select a hearing location as close to the Owner's locale as possible.

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EXHIBIT D

Construction Manager's Insurance Certificate

TO BE PROVIDED

EXHIBIT E

Work to be Performed by CM's Own Personnel

TO BE PROVIDED

ATTACHMENT TO AIA DOCUMENT A133-2019, *Standard Form of Agreement Between Owner and Construction Manager as Constructor* where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price.

The provisions of this Attachment shall delete, modify, and supplement the provisions contained in the "***Standard Form of Agreement Between Owner and Construction Manager as Constructor***", AIA Document A133-2019 Edition. The provisions contained in these Modifications shall supersede any conflicting provisions of the AIA Document. The term "Agency," as used in these Modifications, shall mean the United States of America, acting through the United States Department of Agriculture.

ARTICLE 3, CONSTRUCTION MANAGER'S RESPONSIBILITIES

3.1.5 Phased Construction: Delete the entire paragraph

3.3.2.1 Add a sentence to the end of subparagraph 3.3.2.1 reading "The Construction Manager shall schedule on-site progress meetings no less than once a month during the periods of active construction."

ARTICLE 11, PAYMENTS FOR CONSTRUCTION PHASE SERVICES

11.1.1: Add the following "using AIA Document G702, 'Application and Certificate for Payment,' or Form RD 1924-18, 'Partial Payment Estimate,'" after "Payment issued by the Architect,".

11.1.8 Replace 11.1.11 with the following:

The Owner and Construction Manager shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors. Except with the Owner's prior approval, payments to Subcontractors shall be subject to retention of not less than ten percent (10%). The Construction Manager shall execute subcontracts in accordance with those agreements.

11.1.8.2 Insert the following subparagraph:

11.1.8.2 The amount retained shall be 10% of the value of Work until 50% of the Work has been completed. At 50% completion, further partial payments shall be made in full to the Construction Manager and no additional amounts may be retained unless the Architect certifies that the Work is not proceeding satisfactorily, but amounts previously retained shall not be paid to the Construction Manager. At 50% completion or any time thereafter when the progress of the Work is not satisfactory, additional amounts may be retained but in no event shall the total retainage be more than 10% of the value of Work completed.

11.2.2.3 Replace the subparagraph with the following:

If the Owner's auditors report the Cost of the Work as substantiated by the Construction Manager's final accounting to be less than claimed by the Construction Manager, the Construction Manager shall not be entitled to request mediation of the disputed amount without seeking an initial decision pursuant to Section 15.2 of A201-2017 unless the Owner specifically authorizes such action in writing. If such action has been authorized by the Owner, the Construction Manager may make a request for mediation within 30 days after the Construction Manager's receipt of a copy of the Architect's final Certificate for Payment.

11.2.5 Insert the following subparagraph:

11.2.5 Amounts withheld from the final payment to cover any incomplete Work are not considered retainage and shall not be paid to the Construction Manager until the work is actually completed and accepted by the Owner. Such withholdings shall not be less than 150% of the estimated cost to complete the Work.

ARTICLE 14, MISCELLANEOUS PROVISIONS

14.6 Insert the following paragraph:

14.6 If the Work is not substantially complete on or before the date of Substantial Completion established in paragraph 1.1.4, or extension thereof granted by the Owner, the Construction Manager shall pay to the Owner liquidated damages in the sum of \$_____ for each calendar day of delay. Any sums that may be due by the Construction Manager to the Owner as liquidated damages may be deducted from any monies due or to become due to the Construction Manager under the Contract or may be collected from the Construction Manager's surety.

14.7 Insert the following paragraph:

14.7 This Agreement shall not become effective until concurred with in writing by the Agency. Such concurrence shall be evidenced by the signature of a duly authorized representative of the Agency in the space provided at the end of the Agency Attachment to this Agreement.

ARTICLE 15, SCOPE OF THE AGREEMENT

15.1 Delete the last sentence of section 15.1 and replace it with the following sentence:

"This Agreement may be amended only by written instrument signed by Agency, the Owner, and the Construction Manager."

15.2.6 The following Documents should be referenced, if applicable:

Attachment to the ***Standard Form of Agreement Between Owner and Construction Manager as Constructor*** (this Attachment)
General Conditions of the Contract for Construction, AIA A201-2007
Attachment to the *General Conditions of the Contract for Construction* (RD Instruction 1942-A, Guide 27, Attachment 4)
Invitation for Bids
Instructions to Bidders (AIA Document A701-1997)
Attachment to *Instructions to Bidders* (RD Instruction 1942-A, Guide 27, Attachment 2)
Bid Form
Bid Bond
Compliance Statement (Form RD 400-6) Payment Bond
Performance Bond
Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions (Form AD 1048)
Disclosure of Lobbying Activities (Form SF-LLL)
Certification for Contracts, Grants and Loans (RD Instruction 1940-Q, Exhibit A-1)

SIGNATURE BLOCK:

The following signature block shall replace the signature block following paragraph 15.2:

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in duplicate on the respective dates indicated below:

ATTEST: _____	OWNER:
Type Name _____	By _____
Title _____	Type Name _____
Date _____	Title _____
	Date _____

ATTEST: _____	CONSTRUCTION MANAGER:
Type Name _____	By _____
Title _____	Type Name _____
Date _____	Title _____
	Date _____

AGENCY CONCURRENCE:

By _____
Type Name _____
Title _____
Date _____

The concurrence so evidenced by the Agency shall in no way commit the Agency to render financial assistance to the Owner and is without liability to the Agency for any payment hereunder, but in the event such assistance is provided, the concurrence shall signify that the provisions of this Agreement are consistent with Agency requirements.

SECTION 00-7200
CONDITIONS OF THE CONTRACT

PART 1 GENERAL

1.01 FORM OF GENERAL CONDITIONS

- A. The project shall be governed by the contract Exhibit C and USDA Supplement version of the AIA 201 General and Supplementary Conditions of the Contract for Construction in Section 00-5200.

END OF SECTION

SECTION 01-1000
SUMMARY OF WORK

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Freestanding Medical Office Building for SCCH
- B. Owner's Name: _____.
- C. Architect's Name: Johnson Johnson Crabtree Architects P.C..
- D. The Project consists of the construction of an approximately 26,200 square foot, one-story, medical office building with approximately 16,500 square foot of buildout. Shell, Buildout and Site are in different packages for permitting. The Work consists of construction of a new building, landscape development, and paving and other site improvements. Initial site work noted as Phase 1 in the Civil Documents has started to get the utilities installed and the building pad prepared.
- E. Prior to submission of bid, contractor to review the site conditions and report any issues noted in being able to perform the work as indicated in the Contract Documents

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in the Bid Requirements.

1.03 REPORTS AVAILABLE TO THE CONTRACTOR

- A. Geotechnical Report:
 - 1. Sub-surface investigation has been performed at the project site. This investigation was conducted, and a report obtained, solely for design purposes and is not a part of the Contract Documents.
 - 2. The use and interpretation of this information will be entirely the responsibility of the using party. The Owner is not responsible for variations in the sub-surface conditions. Bidders shall decide for themselves the character of the material to be encountered.
 - 3. The report of the subsurface soil investigation by an independent testing laboratory is available upon request from the Owner for use and reference during construction. Reference the geotechnical report by TTL, dated November 13, 2023 to be issued by the Architect.

1.04 WORK BY OWNER

- A. Owner has awarded a contract for supply and installation of Phase 1 in the Civil Documents which is scheduled to be complete on April 1, 2024.
- B. Owner will supply the following for installation by Contractor:
 - 1. Reference Owner Furnished Equipment Brochure under separate cover..
 - a. The Owner will arrange and pay for delivery of Owner-furnished items in accordance with the Contractor's Construction Schedule, and will inspect deliveries for damage.

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- b. If Owner-furnished items are damaged, defective or missing, the Owner will arrange for replacement. The Owner will also arrange for manufacturer's field services, and the delivery of manufacturer's warranties and bonds to the Contractor.
 - c. The Contractor is responsible for designating the delivery dates of Owner-furnished items in the Contractor's Construction Schedule and for receiving, unloading and handling Owner-furnished items at the site. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements, and to repair or replace items damaged as a result of his operations.
2. Toilet Accessories as noted in Section 10-2800.
 3. Fire Extinguishers as noted in Section 10-4400.

1.05 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.
- D. The Owner reserves the right to occupy and to place and install equipment in completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1.06 CONTRACTOR USE OF SITE AND PREMISES

- A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the project site. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project.
- B. 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.
- C. Time Restrictions:
 1. Limit conduct of especially noisy work in accordance with the Owner's requirements to be determined prior to start of the Work..
- D. Utility Outages and Shutdown:
 1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
 2. Prevent accidental disruption of utility services to other facilities.
 3. Limit duration of each such disruption of service to maximum of 4 hours or as approved by Owner.

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4. Fabricate and install interconnecting portions of these systems prior to shut-down for final connections.
 5. Maintain utilities or other service, indicated to be abandoned, in service or provide alternate means of service until new facilities are provided, tested, and ready for use.
 6. Maintain fire protection and alarm systems at all times within existing facilities.
 7. Review all existing conditions, drawings and other documents for proper coordination between new and existing construction
 8. Active Utilities Whose Locations are Unknown to Owner but Suspected to Exist: Contractor shall be cautious of their existence. If they are encountered, immediately report to Owner for direction.
 9. Damages to existing structures, utilities and other items which are caused by Contractor's operations shall be repaired or replaced to their original conditions
- E. Use of New Facilities:
1. Do not load structure with weights that will endanger structure.
 2. Smoking is absolutely prohibited within new facilities, on the roof, or on Owner's property, except in designated area.
 3. Use of toilet facilities, washrooms, and telephones within a new facility is not allowed.
 4. Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.
 5. Maintain new building in a weathertight condition throughout construction period. Repair damage and leaks caused by construction operations. Take all precautions necessary to protect building during construction period.
- F. Use of Occupied Site: Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed without written approval of Owner.
1. Obtain written approval from Owner at least 7 days in advance when scheduling Work outside limits of construction. Provide Owner an estimate of time needed to perform Work outside limits of construction.
 2. Cutting, capping, and reconnecting utility systems outside limits of construction shall be performed by Contractor, unless otherwise noted.
 3. Conform to all laws, ordinances, permits and regulations affecting the Work on site.
 4. Existing roads, streets, drives, parking lots, entrances and required fire exitways serving the premises shall be kept clear and available at all times for their intended use. These areas shall not be used for parking, staging or storage without the Owner's written approval. Coordinate with Owner, and provide alternate routes for public and Owner access if normal routes are affected. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
 5. Do not unreasonably encumber site with equipment, materials, or vehicles.
 6. Return all improvements on or about site and adjacent property which are not shown to be altered, removed or otherwise changed; to conditions which existed previous to starting performance under the Contract.

7. T-shirts or other clothing with derogatory depictions, language, and/or slogans regarding alcohol, drugs, race or sexual in nature, shall not be worn on premises.
8. Derogatory language regarding race, sexual or religious in nature, shall not be used on premises.
9. Construction personnel will not at any time park in any Owner parking lot, on Owner property without Owner's consent, and will not park on adjacent residential streets.

1.07 COORDINATION

- A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming Work, provide openings for penetrations of existing surfaces, and provide samples for testing if required. Seal penetrations through floors, walls, and roofing.

1.08 DEFINITIONS AND EXPLANATIONS

- A. Imperative language is used generally in the specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by the Contractor as if preceded by the phrase "The Contractor shall".
- B. The term "provide" means furnish and install, complete, and ready for intended use.
 1. Except as otherwise defined in greater detail, the term "furnish" means supply and deliver to the project site, including unloading, unpacking, inspecting, and storing until ready for receipt by Owner, installation, etc., as applicable.
 2. Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations, as applicable.
- C. The term "indicated" is used as cross-reference to graphics, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shows", "noted", "schedules", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitations of location is intended.

1.09 PROVISIONS FOR MAINTAINING HEALTHCARE DESIGN/CONSTRUCTION STANDARDS

- A. The Contractor is required to provide and maintain certain quality standards for construction and equipment for the project as covered in 2018 Facility Guidelines Institute (FGI) publication "Guidelines for Design and Construction of Outpatient Facilities" and as indicated in this section.
 - 1. Codes/Regulations/Reference Standards
 - a. General: Comply with local and governing codes and regulations. See Code Analysis on drawings for applicable codes.
 - 2. Environmental Pollution Control:
 - a. Comply with federal, state and local environmental statutes for construction of hospital and medical facilities.
 - b. Contact the appropriate U.S. Department of Health and Human Services (HHS) and U.S. Environmental Protection Agency (EPA) offices and state and local authorities having jurisdiction for the latest applicable regulations prior to proceeding with the work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01-2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.
- F. Material/Fabrication Values: For each unit of work where payment requests will be made on account of materials or equipment purchased/fabricated/delivered but not yet installed, show "initial value" for payment request and "value added" for subsequent stage or stages of completion on that unit of work.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.

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10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- I. Submit number of copies to be verified at first Owner/Architect/Contractor meeting. Include with one copy waivers of lien and similar attachments.
 1. Transmit to Architect to ensure receipt within 24 hours.
- J. Include the following with the application:
 1. Partial release of liens from major subcontractors and vendors.
 2. Certificates of Insurance attesting to off-site stored products.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
- L. Stored Materials: Include in Payment Application amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 1. Provide certificate of insurance, evidence of transfer of title to Owner and consent of surety to payment, for stored materials.
 2. Provide supporting data that verifies amount requested, such as invoices.
- M. Initial Payment Application: The following must be received by the Architect prior to submittal of the first payment application.
 1. Listing of subcontractors and principal suppliers and fabricators.
 2. Schedule of values.
 3. Progress schedule.
 4. Schedule of principal products.
 5. Schedule of submittals.
 6. Listing of Contractor's staff assignments and principal consultants.
 7. Copies of acquired building permits and similar authorizations and licenses from governing authorities for the current performance of the work.
 8. Data needed by Owner to acquire insurance coverage required of the Owner.
 9. Initial settlement survey and damage report, if required.
 10. Initial progress report, including report of preconstruction meeting.
- N. Application at Time of Substantial Completion:
 1. Following the issuance of the Architect's "Certificate of Substantial Completion", and also in part as applicable to prior certificates on portions of completed work as designated, a "special" payment application may be prepared and submitted by the Contractor.

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2. The principal administrative actions and submittals which must precede or coincide with such special applications are specified in the General Conditions, and elsewhere in the Contract Documents.
 3. Those specifically related to the application can be summarized as follows, but not limited to these:
 - a. Occupancy permits and similar approvals or certifications by governing authorities and franchised services, assuring Owner's full access and use of the completed work.
 - b. Warranties, guarantees, maintenance agreements and similar provisions of the Contract Documents.
 - c. Test/adjust/balance records, maintenance instructions, meter readings, start-up performance reports, and similar change-over information germane to the Owner's occupancy, use, operation and maintenance of the completed work.
 - d. Final cleaning of the work.
 - e. Application for reduction (if any) of retainage, and Consent of Surety.
 - f. Advice to Owner on coordination of shifting insurance coverage, including proof of extended coverage as required.
 - g. Final progress photographs, if required.
 - h. Listing of incomplete work (Punch List) recognized to be completed by the Contractor, as exceptions to the Architect's Certificate of Substantial Completion.
- O. Final Payment Application:
1. The administrative actions and submittals which must proceed or coincide with submittal of the final payment application can be summarized as follows, but not necessarily limited to these:
 - a. Completion of project closeout requirements.
 - b. Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed and accepted will be completed without undue delay.
 - c. Transmittal of required project construction record documents and materials to Owner.
 - d. Proof, satisfactory to Owner, that taxes, fees and similar obligations of the Contractor have been paid.
 - e. Removal of temporary facilities, services, surplus materials, rubbish and similar provisions.
 - f. Change over of door locks and other Contractor access to Owner's property.
 - g. Consent of Surety for Final Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01-2100
ALLOWANCES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cash allowances.
- B. Contingency allowance.
- C. Floor moisture vapor emission control allowance
- D. Inspecting and testing allowances.
- E. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

- A. Section 01-2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts, less cost of delivery to site
- B. Costs Not Included in Cash Allowances: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing. _____ .
- C. Architect Responsibilities:
 - 1. Consult with Contractor for consideration and selection of products, suppliers , and installers.
 - 2. Select products in consultation with Owner and transmit decision to Contractor.
- D. Contractor Responsibilities:
 - 1. Obtain proposals from suppliers and installers and offer recommendations.
 - 2. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
 - 3. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - 4. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- E. Differences in costs will be adjusted by Change Order.

1.04 CONTINGENCY ALLOWANCE

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Allowance to be developed by the Contractor, agreed to by the Owner and identified on the Schedule of Values to be tracked throughout construction.

- C. Funds will be drawn from the Contingency Allowance only by Change Order or other agreed upon method in writing.
- D. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order unless agreed upon otherwise in writing.

1.05 FLOOR MOISTURE VAPOR EMISSION CONTROL ALLOWANCE

- A. Contractor's costs for products, delivery, installation, and labor needed for installation of moisture mitigation system at slab-on-grade or elevated concrete slabs in order to install flooring on the schedule developed by the Contractor. See Section 09-6100 - MOISTURE VAPOR EMISSION CONTROL for details.
 - 1. Allowance to include surface preparation and application of floor moisture mitigation product at all flooring types with the exception of ceramic and porcelain tile. Allowance to identify total area for application so that a cost per square foot can be determined.
- B. Allowance to be developed by the Contractor, agreed to by the Owner and identified on the Schedule of Values to be tracked throughout construction.
- C. Funds will be drawn from the Floor Moisture Mitigation Allowance only by Change Order or other agreed upon method in writing after floor testing is complete.
- D. At closeout of Contract, funds remaining in Floor Moisture Mitigation Allowance will be credited to Owner by Change Order unless agreed upon otherwise in writing.

1.06 INSPECTING AND TESTING ALLOWANCES

- A. Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.
- B. Allowance to be developed by the Contractor, agreed to by the Owner and identified on the Schedule of Values to be tracked throughout construction.
- C. Costs Not Included in the Inspecting and Testing Allowances:
 - 1. Costs of incidental labor and facilities required to assist inspecting or testing agency.
 - 2. Costs of testing services used by Contractor separate from Contract Document requirements.
 - 3. Costs of retesting upon failure of previous tests as determined by Architect.

1.07 ALLOWANCES SCHEDULE

- A. Contingency Allowance: Include the stipulated sum/price of an amount agreed to with the Owner for use upon Owner's instructions.
- B. Floor Moisture Vapor Emission Control Allowance: Include the amount necessary to provide floor mitigation for all non-tile floor surfaces.
- C. Inspecting and Testing Allowance: Include the amount necessary to provide inspecting and testing services specified in Section 01-4529 - Testing Laboratory Services.

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PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01-2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for pricing Alternates.

1.02 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

REFER TO INDEX SEET OF DRAWINGS FOR ALTERNATES LIST.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01-2513
PRODUCT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for requesting approval of proposed substitutions.
- B. The requirements of this section govern the use of "Substitution Request Form - Section 01-2514.

1.02 SUBSTITUTION CLAUSE

- A. When a material, article, or piece of equipment is identified on the drawings or in the specifications by reference to manufacturer's or vendor's name, trade name, catalog number, or the like, it is only identified to establish a standard. Any material, article, or piece of equipment of other manufacturers or vendors that will perform equally or better the duties imposed by the general design will be considered equally acceptable provided the proposed items are, in the opinion of the Architect, of equal substance, appearance, and function. These items shall not be purchased or installed by the Contractor without the Architect's written approval.
 - 1. Any item to be considered under the above clause shall be considered a substitution and shall be submitted for review in accordance with the requirements of this Specification Section.

1.03 LIMITATIONS ON SUBSTITUTIONS

- A. Substitutions will not be considered unless the Substitution Request Form is used and the requirements of this section are fully complied with.
 - 1. Other types of forms are not acceptable.
- B. Substitutions will not be considered when indicated on shop drawings or product data submittals without separate formal request complying with "submittal procedures" specified in this section.
- C. Substitutions will not be considered unless submitted through the Contractor.
- D. Additional studies, investigations, submittals, redesign and/or analysis by the Architect caused by the requested substitutions shall be paid by the Contractor at no expense to the Owner.
- E. Substitute products shall not be ordered or installed without written acceptance.
- F. Only one request for substitution for each product will be considered. When substitution is not accepted by the Architect, provide the specified product.
- G. Architect will determine the acceptability of all substitutions.

1.04 REQUESTS FOR SUBSTITUTIONS

- A. Contractor's Representation:
 - 1. Request for substitution constitutes a representation that the Contractor:

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- a. Has investigated the proposed product and has determined; that it is equal to or superior in all respects to the specified product.
 - b. Will provide same type of warranty for substitution as for specified product.
 - c. Contractor's warranty shall be in writing guaranteeing all substituted products have same or superior performance as the product specified.
 - d. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
 - e. Waives all claims for additional costs related to substitutions which consequently become apparent.
 - f. Has thoroughly investigated the proposed substitute to determine if license fees and royalties are pending on the proposed substitute, for compliance with General Conditions of the Contract.
2. Request for substitution constitutes a representation that the cost data is complete and includes all related cost under his Contract, but excludes any approved Architect's design fees required by substitution.
- B. Requests for substitutions shall be submitted on Substitution Request Form. Legible copies of this form shall be made as required for Contractor's submittals. Each submittal request form shall be complete with data substantiating compliance of proposed substitution with requirements of Contract Documents.

1.05 SUBMITTAL PROCEDURES FOR BID WORK

- A. Submit separate Substitution Request Form each substitution.
 1. Form shall be completely and properly filled in as required by this Section. If form is incomplete, the Architect reserves the right to reject and return form to Contractor for completion and compliance.
 2. Submit to Architect the completed and signed form.
- B. Submit substitution requests a minimum of 7 days prior to Bid Date to provide sufficient time for reviews.
- C. Acceptable substitutions will be identified in addenda.
- D. Bidders submitting bids in reliance upon a substitution when the substitution has not been approved prior to bidding do so at their own risk.
- E. For approved substitutions, submit shop drawings, product data, and samples in accordance with Section 01-3323.

PRODUCTS – NOT USED

EXECUTION – NOT USED

END OF SECTION

SECTION 01-2514
SUBSTITUTION REQUEST FORM

ARCHITECT/ENGINEER WILL NOT REVIEW THIS FORM UNLESS COMPLETELY FILLED OUT INCLUDING SALIENT CHARACTERISTICS COMPARISON.

1.01 PROJECT INFORMATION:

- A. Project Name: Freestanding Medical Office Building for SCCH
- B. Project Address: Sullivan, Indiana

1.02 SUBMIT TO:

- A. Johnson Johnson Crabtree Architects PC
- B. 4551 Trousdale Dr.; Nashville, TN 37204
- C. P: (615) 837-0656 / F: (615) 837-0657
- D. Attention: Harry Hadlock

1.03 SUBSTITUTION INFORMATION:

- A. DATE SUBMITTED: _____
- B. SPEC. SECTION # & TITLE _____ - _____
- C. SPECIFIED ITEM: _____
- D. PARAGRAPH NO. (EXAMPLE 2.3.A.) _____
- E. PROPOSED SUBSTITUTE: _____
- F. SUBSTITUTE MANUF. WEBSITE/DIRECT LINK TO PRODUCT: _____
 - 1. How will dimensions, gauges, and weights indicated in Contract Documents be changed by proposed substitute? _____

 - 2. How will wiring, piping, and duct work indicated in Contract Documents be changed by proposed substitute? _____

 - 3. How will other trades be effected by proposed substitute? _____

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4. How will the construction schedule be effected by the proposed substitute? _____

5. How will the proposed substitute change unit costs? Circle below:
No change. Cost will decrease by _____. Cost will increase by _____. Provide breakdown for cost changes on attached sheet.
6. How will the manufacturers warranty of proposed substitute differ from warranty indicated in Construction Documents?

7. Provide a point-by-point comparison of the important salient characteristics of proposed substitute against the specified item. Attach additional pages as needed. Do not leave this section blank or use words like "no difference" or "None".
8. Subcontractor Company Name: _____
a. Company Representative: _____
b. Telephone # _____ email address _____
9. The undersigned makes the following certifications:
a. The proposed substitution has been fully investigated and determined to have overall performance and longevity equal or superior to the specified product.
b. That cost data is complete and that no claim for additional cost will be made after Substitution Request is accepted.
c. That coordination, installation and changes associated with substitution will be complete.
10. General Contractor Company Name: _____
a. Company Representative: _____
b. Address: _____
c. Telephone: _____ Email: _____
d. Signature & Date: _____
11. Architects Acceptance
a. Accepted as noted _____ Rejected _____ (See comments below)
b. Comment _____

- c. Architect's Approval: _____ Date: _____

END OF SECTION

**SECTION 01-2527
WEATHER DELAYS**

PART 1 GENERAL

1.01 EXTENSIONS OF CONTRACT TIME

- A. If the basis exists for an extension of time in accordance with the General Conditions of the Contract, an extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.

1.02 STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE

- A. The Owner has reviewed weather data available from the National Oceanic and Atmospheric Administration (NOAA) and determined that the Standard Baseline of average climatic range for the State the Project is located in is to match the NOAA data.
- B. Standard Baseline shall be regarded as the normal and anticipated number of calendar days for each month during which construction activity shall be expected to be prevented and suspended because of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

1.03 ADVERSE WEATHER AND WEATHER DELAY DAYS

- A. Adverse weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within twenty-four (24) hours.
 - 1. Precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure.
 - 2. Temperatures which do not rise above 32 degrees F by 10:00 a.m
 - 3. Temperatures which do not rise above that specified for the day's construction activity by 10:00 a.m., if any is specified.
 - 4. Sustained wind in excess of twenty-five (25) m.p.h.
 - 5. Standing snow in excess of one inch (1.00").
- B. Adverse weather may include, if appropriate, "dry-out" or "mud" days:
 - 1. For rain days above the standard baseline.
 - 2. Only if there is a hindrance to site access or sitework, such as excavation, backfill, and footings; and
 - 3. At a rate no greater than 1 make-up day for each day or consecutive days of rain beyond the standard baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the Designer.
 - 4. A weather delay day may be counted if adverse weather conditions noted above prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled work day, including a weekend day or holiday if Contractor has scheduled construction activity that day.

1.04 DOCUMENTATION AND SUBMITTALS

- A. Submit daily jobsite work logs showing which and to what extent construction activities have been affected by weather on a monthly basis.
- B. Submit actual weather data to support claim for time extension obtained from nearest NOAA weather station or other independently verified source approved by designer at beginning of project.
- C. Use Standard Baseline data provided in this section when documenting actual delays due to weather in excess of the average climatic range.
- D. Organize claim and documentation to facilitate evaluation of a basis of calendar month periods, and submit in accordance with the procedures for claims established in the General Conditions of the Contract.
- E. If an extension of the Contract Time is appropriate, it shall be effected in accordance with the provisions of the General Conditions of the Contract, and the applicable General Requirements.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01-2600
CONTRACT MODIFICATIONS PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for considering and processing Change Orders.
- B. Related Requirements:
 - 1. Agreement: The amounts of established unit prices.
 - 2. Conditions of the Contract:
 - a. Methods of determining cost or credit to Owner resulting from changes in Work made on a time and material basis.
 - b. Contractor's claims for additional costs.
 - 3. Section 01-2100 - Allowances.
 - 4. Section 01-2000 - Price and Payment Procedures.
 - 5. Section 01-7800 - Closeout Submittals.
- C. Forms for Changes: See Bidding Documents/ Agreement.

1.02 PROPOSAL PROCEDURES

- A. Owner or Architect may initiate a potential change by submitting a Proposal Request or Supplemental Instructions to Contractor. Request will include the following:
 - 1. Detailed description of the Change, Products, and location of the change in the Project.
 - 2. Supplementary or revised Drawings and Specifications.
 - 3. The projected time span for making the change and a specific statement as to whether overtime work is, or is not, authorized.
 - 4. A specific period of time during which the requested price will be considered valid.
 - 5. Such request is for information only, and is not an instruction to execute the changes, or to stop Work in progress.
- B. Contractor may initiate a request for changes by submitting a written notice to Architect, containing the following:
 - 1. Description of the proposed changes.
 - 2. Statement of the reason for making the changes.
 - 3. Statement of the effect on the Contract Sum and the Contract Time.
 - 4. Statement of the effect on the work of separate contractors.
 - 5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.
- C. Provide full written data required to evaluate changes.
 - 1. Maintain detailed records of work performed on a time-and-material/force account basis.
 - 2. Provide full documentation to Architect upon request.
- D. Designate in writing the member of Contractor's organization:
 - 1. Who is authorized to accept changes in the Work.

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2. Who is responsible for informing others in the Contractor's organization of the authorization of changes in the Work.
- E. Owner will designate in writing the person who is authorized to execute Change Orders.

1.03 CONSTRUCTION CHANGE DIRECTIVES

- A. In absence of total agreement on the terms of a Change Order, the Architect may prepare and issue a Construction Change Directive directing a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive will describe changes in the Work and describe the method of determining any change in the Contract Sum or Contract Time, or both.
 2. Construction Change Directive will be signed by Owner and Architect.
- B. Upon receipt of a Construction Change Directive, Contractor shall do the following:
1. Promptly proceed with the change in the Work involved.
 2. Promptly advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.
- C. A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them.
1. Such agreement shall be effective immediately and shall be recorded as a Change Order.
 2. If Contractor does not respond promptly or disagrees with the Construction Change Directive, he shall comply with General Conditions.
- D. A Construction Change Directive shall be processed in compliance with requirements of the General Conditions.

1.04 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Architect to evaluate the quotation.
- B. On request provide additional data to support time and cost computations:
1. Labor required.
 2. Equipment required.
 3. Products required:
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 4. Taxes, insurance and bonds.
 5. Credit for work deleted from Contract, similarly documented.
 6. Overhead and profit, for subcontractor and General Contractor separately.
 7. Justification for any change in Contract Time.

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- C. Support each claim for additional costs, and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal, plus the following additional information:
 - 1. Name of the Owner's authorized agent who ordered the Work, and date of the order.
 - 2. Dates and hours work was performed, and by whom.
 - 3. Time record, summary of hours worked, and hourly rates paid.
 - 4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing of quantities.
 - c. Subcontracts.
 - d. Overhead and Profit, Taxes, Insurance.
- D. Document requests for substitutions for Products as specified elsewhere in Division 1.

1.05 PREPARATION OF CHANGE ORDERS

- A. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
- B. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

1.06 LUMP-SUM/FIXED PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Architect's Proposal Request and contractor's responsive Proposal as mutually agreed between Owner and Contractor.
 - 2. Contractor's Proposal for a change, signed by the Contractor, as recommended by Architect.
- B. Owner and Architect will sign and date the Change Order as authorization for the Contractor to proceed with the changes, after the Contractor has signed the Change Order.

1.07 UNIT PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Architect's definition of the scope of the required changes.
 - 2. Contractor's Proposal for a change, as recommended by the Architect.
 - 3. Survey of completed work.
- B. The amounts of the unit prices to be:
 - 1. Those stated in the Agreement.
 - 2. Those mutually agreed upon between Owner and Contractor.
- C. When quantities of each of the items affected by the Change Order can be determined prior to start of the work:
 - 1. Owner and Architect will sign and date the Change Order as authorization for Contractor to proceed with the changes, after the Contractor as signed the Change Order.

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- D. When quantities of the items cannot be determined prior to start of the work:
 - 1. Architect or Owner will issue a Construction Change Directive directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.
 - 2. At completion of the change, Architect will determine the cost of such work based on the unit prices and quantities used.
 - a. Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.
 - 3. Architect will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
 - 4. Owner and Contractor will sign and date the Change Order to indicate their agreement with the terms therein.

1.08 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/CONSTRUCTION CHANGE AUTHORIZATION

- A. Architect or Owner will issue a Construction Change Directive directing Contractor to proceed with the changes.
- B. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this Section.
- C. Architect will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
- D. Owner and Contractor will sign and date the Change Order to indicate their agreement therewith.

1.09 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. Periodically revise Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record the adjusted Contract Sum.
- B. Periodically revise the Construction Schedule to reflect each change in Contract Time.
 - 1. Revise sub-schedules to show changes for other items of work affected by the changes.
- C. Upon completion of Work under a Change Order, enter pertinent changes in Record Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01-3119
PROJECT MEETINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Contractor's Responsibilities:
 - 1. Schedule and administer meetings throughout duration of work.
 - 2. Prepare agenda for meetings.
 - 3. Distribute written notice of each meeting seven working days in advance of meeting date.
 - 4. Make physical arrangements for meetings.
 - 5. Preside at meetings.
 - 6. Record the minutes; include all significant proceedings and decisions.
 - 7. Reproduce and distribute copies of minutes within three working days after each meeting.
 - a. Provide one copy to:
 - 1) All participants in the meeting, including the Architect.
 - 2) All parties affected by decisions made at the meeting.
 - 8. Provide updated Project Schedule.
- B. Participants:
 - 1. Qualified representative of Contractors, Subcontractors, and Suppliers authorized to act on behalf of the parties they represent.
 - 2. Owner's Representative at their option.

1.02 PRE-CONSTRUCTION MEETING

- A. Schedule meeting within the early stages of Construction as determined by the Contractor.
- B. Suggested Agenda: Prepare written material, distribute lists, and discuss the following:
 - 1. Identification of major Subcontractors and Suppliers.
 - 2. Projected construction schedules.
 - 3. Critical work sequencing.
 - 4. Major equipment deliveries and priorities.
 - 5. Project coordination, including designation of responsible persons.
 - 6. Procedures for, and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals.
 - d. Change orders.
 - e. Applications for payments.
 - 7. Adequacy of distribution of Contract Documents.
 - 8. Procedures for Maintaining Record Documents.
 - 9. Use of premises:
 - a. Office, work and storage areas.

- b. Owner's requirements.
- c. Construction facilities, construction aids, and controls.
- d. Procedures for preventing interaction of hazardous roof materials with HVAC intakes.
- e. Temporary utilities.
- f. Safety and first aid procedures.
- g. Security procedures.
- h. Smoking policy.
- i. Housekeeping procedures.
- j. Working days/hours.

1.03 PROGRESS MEETINGS

- A. Schedule regular monthly meetings and as necessary, schedule additional meetings.
- B. Suggested Agenda:
 - 1. Review and approval of minutes of previous meeting.
 - 2. Review of work progress since previous meeting.
 - 3. Field observations, problems, conflicts.
 - 4. Problems which impede construction schedule.
 - 5. Review of off-site fabrication, delivery schedules.
 - 6. Corrective measures and procedure required to regain projected schedule.
 - 7. Revisions to construction schedule.
 - 8. Plan progress and schedule for succeeding work period.
 - 9. Coordination of schedules.
 - 10. Review submittal schedules; expedite as required.
 - 11. Maintenance of quality standards.
 - 12. Review proposed changes for:
 - a. Effect on construction schedule and on completion date.
 - b. Effect on other contracts of the Project.
 - 13. Other business.

1.04 PRE-INSTALLATION MEETINGS

- A. Notify Architect ten working days before meeting date.
- B. Envelope and Roofing Pre-Installation Conference:
 - 1. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting with the following attendees:
 - a. Contractor's Project Manager and Project Superintendent
 - b. Architect's Representative
 - c. Subcontractors responsible for portions of the Work associated with the building envelope and roof, including the following as applicable to the project: Masonry, fiber cement siding, exterior studs, exterior sheathing and vapor retarder, windows, through-wall flashing, sealants, roofing (insulation, lightweight concrete, roofing material), metal flashing/ fascia, roof drains, mechanical roof equipment, and any other subcontractors the Contractor feels need to be present for the discussion.

- d. Manufacturers representatives for portions of the Work associated with the building envelope and roof, including the following as applicable to the project: Brick, fiber cement siding, exterior studs, exterior sheathing, flashing, sealants, roofing, and any other subcontractors the General Contractor feels need to be present for the discussion.
 2. Agenda: Review submittals, project specifications, pertinent details, testing requirements, and design intent.
 3. Recording: The Contractor shall record discussions of conference and decisions reached, and furnish copy of record to each attendee.
- C. Door Hardware Pre-Installation Conference:
1. Prior to starting door hardware installation, the Contractor shall set up a job site meeting with the following attendees:
 - a. Contractor's Project Manager and Project Superintendent
 - b. Architect's Representative
 - c. Subcontractors responsible for portions of the Work associated with the door hardware installation, including the following as applicable to the project: Door Hardware, Automatic Operators, Electrical and any other subcontractors the General Contractor feels need to be present for the discussion
 - d. Owner's Representatives responsible for the installation and coordination of the door hardware, including the following as applicable to the project: Low voltage, Security, Keying, etc
 2. Agenda: Review door function and design intent of specialized doors and parties responsible for each component necessary. See Section 08-7100 - Door Hardware for more details.
 3. Recording: The Contractor shall record discussions of conference and decisions reached, and furnish copy of record to each attendee.
- D. Mechanical, Plumbing and Electrical Pre-Installation Meeting
1. Prior to starting mechanical, plumbing and electrical work above slab, the Contractor shall set up a job site meeting with the following attendees:
 - a. Contractor's Project Manager and Project Superintendent
 - b. Architect's Representative
 - c. Owner's Representatives responsible for the maintenance of mechanical, plumbing and electrical equipment.
 - d. Mechanical, Plumbing and Electrical Engineers
 - e. Subcontractor's responsible for portions of the Work associated with the mechanical, plumbing and electrical systems, and any other subcontractors the Contractor feels needs to be present for the discussion
 2. Agenda: Review project specifications, submittals, design intent and expectations for installation.
 3. Recording: The Contractor shall record discussions of conference and decisions reached, and furnish copy of record to each attendee.
- E. Where elsewhere required in individual Specification Sections, schedule a pre-installation meeting at the job-site prior to starting the work of the Section.

1. Require attendance of entities directly affecting, or affected by, the work of the Section.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01-3200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section includes administrative and procedural requirements for documenting the progress of construction during performance of the work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Submittals Schedule
 - 3. Digital photographs of job site conditions.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Contractor's Construction Schedule: Submit initial schedule, large enough to show entire schedule for entire construction period.
 - 2. Contractor's Submittal Schedule: Submit intended submittal schedule for entire project.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Construction Photographs: Submit digital electronic files as a Project Record Document. Identify electronic media with dates photographs were taken.

1.03 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in scheduling and reporting.
- B. Prescheduling Conference: Conduct conference at project site to review methods and procedures related to the Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages and area separations.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 8. Review time required for completion and startup procedures.
 - 9. Review and finalize list of construction activities to be included in schedule.
 - 10. Review submittal requirements and procedures.
 - 11. Review procedures for updating schedule.

1.04 COORDINATION

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

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- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 PRODUCTS

2.01 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontractors, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Submit concurrently with preliminary construction schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the work and those required early because of long lead time for manufacture or fabrication.
 - a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning and Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the work to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each separate area as a separate numbered activity for each principal element of the work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in 01-3323 in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

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4. Startup and Testing Time: Include not less than seven days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Contractor's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work Under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the work performed by Owner.
 4. Owner-Furnished Products: Include a separate activity for each product with delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
 5. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Use of premises restrictions.
 - b. Seasonal variations.
 - c. Environmental control.
 6. Work Stages: Indicate important stages of construction for each major portion of the work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
 7. Area Separations: Identify each major area of construction for each major portion of the work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.

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- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.
- G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.03 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the work and a cash requirement prediction based on indicated activities.

2.04 CONTRACTOR'S CONSTRUCTION SCHEDULE- CRITIAL PATH METHOD (CPM)

- A. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
 - 1. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 2. Use "one workday" as the unit of time.
- B. CPM Schedule Preparation: Prepare a list of all activities required to complete the work.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 - f. Principal events of activity
 - g. Immediate preceding and succeeding activities.
 - h. Early and late start dates
 - i. Early and late finish date
 - j. Activity duration in workday
 - k. Total float or slack time
 - 2. Format: Mark the critical path.
- C. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

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

2.05 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at project site.
 1. List of subcontractors at project site.
 2. List of separate contractors to project site.
 3. Approximately count of personnel at project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of authorities having jurisdiction.
 12. Change Orders received and implemented.
 13. Construction Change Directives received.
 14. Services connected and disconnected.
 15. Equipment or system tests and startups.
 16. Partial Completions and occupancies.
 17. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.06 SPECIAL REPORTS

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

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

2.07 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in PDF format.

PART 3 EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor to provide planning, evaluation, and reporting using CPM scheduling.
 - 1. Scheduling to be performed by skilled personnel with experience in CPM scheduling and reporting techniques.
 - 2. The individual with scheduling responsibility shall attend all meetings related to project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the work progresses, indicate Actual Completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01-3323
SHOP DRAWINGS, PRODUCT DATA, SAMPLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for processing:
 - 1. Shop Drawings
 - 2. Product Data
 - 3. Office Samples
 - 4. Mock-up Samples
 - 5. Certificate of Compliance
- B. See Section 01-3200 for Submittal Schedule procedures.
- C. See sections 01-7700 and 01-7800 for making closeout submittals.

1.02 GENERAL PROCEDURES

- A. The approval of submittals does not constitute a Change Order.
- B. Contractor to review submittals prior to submitting to the Architect for compliance with the Construction Documents and coordination with field conditions. Contractor to stamp reviewed submittal prior to submitting.
- C. All items shall be submitted under Contractor's transmittal letter. The transmittal letter shall include the following information. If the following information is not included, the submittal will be returned un-reviewed for clarification.
 - 1. Project by title and Architect's project number.
 - 2. Contractor's contract number.
 - 3. Work and products by Specification Section, Article number and type (Product data, shop drawings, certification, etc.).
 - 4. All requirements for submittals specified in this section and individual sections of the Project Manual shall be complied with; partial submittals are not acceptable and will be returned by the Architect.
- D. If submittals are submitted electronically, the submittals are to be forwarded to person at the Architect's Office designated at the Pre-construction meeting and the following procedures are to be used. If the following procedures are not used, the submittal will be returned un-reviewed for clarification.
 - 1. Submittals are to be submitted in a single .pdf with the transmittal letter noted above being the first page of the .pdf.
 - a. Each .pdf is to be named with the project number, specification number, abbreviated title and submittal code.
 - b. If several submittals in the same specification section are included in the .pdf, include all submittal codes in the .pdf name. If the same information is being submitted for different specification sections, include all specification sections in the name.
 - c. Mechanical, electrical, plumbing and telecommunication submittals to be broken out by specification number.

SHOP DRAWINGS, PRODUCT DATA, SAMPLES 01-3323 - 2
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2. Subject line of e-mail to include abbreviated name of project, specification number, and submittal code.
3. The following submittal codes are to be used:
 - a. CA - Calculations
 - b. CC - Certification
 - c. DM - Design Mix
 - d. PD - Product Data
 - e. QL - Qualification Letter
 - f. RP - Report
 - g. SA - Sample
 - h. SC - Schedule
 - i. SD - Shop Drawing
 - j. TR - Test Results
 - k. WA - Warranty
- E. Resubmittals: When Architect requires that a submittal be "resubmitted", comply with requirements of this section.
 1. Identify changes made since the previous submittal.
- F. Notify Architect in writing at time of submittal, of any deviations from the requirements of Contract Documents.
- G. Make all submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.
 1. Architect's Review Time: In scheduling, allow at least 10 working days for Architect's review. (This review time shall apply to Architect's initial review, and allow at least 10 working days to review any subsequent required revision or resubmittal.)
 2. Delays caused by the tardiness of the Contractor in preparing and forwarding of submittals (including failure to include time for possible revisions and resubmittals) will not be an acceptable basis for extension of the Contract completion date or for consideration of alternate products which do not meet the specified requirements of this Project Manual.
- H. Fabricating products which require submittals to be approved by Architect before Architect approves and returns the submittals to Contractor shall be at Contractor's risk.
- I. Starting work which requires submittals to be approved by Architect before Architect approves and returns the submittals to Contractor shall be at Contractor's risk.
- J. Where used in the Contract Documents, the words "or equal" shall be defined as "refer to substitution requirements" specified in Section 01-2513.

1.03 SHOP DRAWINGS

- A. Reproduction of any portion of the Architect's Construction Documents for use as submittals for shop drawings is not acceptable, such submittals will be returned un-reviewed.

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- B. Submit shop drawings in a clear and thorough manner.
 - 1. Title each drawing with Project name and Architect's project number.
 - 2. Identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.
- C. Identify the following:
 - 1. Requirements of the individual section of Project Manual.
 - 2. Field measurements.
 - 3. Field construction criteria.
 - 4. Relation to adjacent or critical features of the Work or products.
 - 5. Conformance of submittal with requirements of Contract Documents.
- D. Shop drawings shall be stamped and signed by Contractor before submitting to Architect. Certify compliance with requirements of Contract Documents. If submittals from the Contractor are marked anything except "approved" or "approved as noted," the submittal will be returned and not checked by the Architect.
 - 1. The Contractor's stamp shall contain a line to be filled in to indicate the applicable specification section(s) of the particular submittal. Submittals received without this information included will be returned without action.
- E. Fabricating products or beginning the work before shop drawings are approved by Architect and returned to Contractor shall be at Contractor's risk.
- F. Number of Copies Required: Submit the number which are required to be returned plus one copy which will be retained by the Architect.

1.04 PRODUCT DATA

- A. Submit only pages which are pertinent.
 - 1. Mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number.
 - 2. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
 - 3. Provide current safety data sheets for products and materials which are hazardous or potentially hazardous to handle and install in the project. A copy of the data sheets shall be on file in job office for use by employees on the job site.
- B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.
- C. Each set of manufacturer's product data shall be stamped and signed by Contractor before submitting to Architect to certify compliance with requirements of Contract Documents.
- D. Number of Copies Required: Submit the number which are required to be returned plus one copy which will be retained by the Architect.

1.05 OFFICE SAMPLES

- A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures, and patterns, for Architect's selection.
 - 1. Original color samples must be submitted. Electronic or copies of samples do not accurately represent color and are not acceptable.
- B. Submit samples to illustrate functional characteristics of products, including parts and attachments.
- C. Approved samples which may be used in the Work are indicated in the Specification section.
- D. Label each sample with identification required for transmittal letter.
- E. Number Required: Submit the number which are required to be returned plus one copy which will be retained by the Architect.

1.06 MOCK-UP SAMPLES

- A. Where mock-up samples and similar samples are indicated in the individual specifications section, comply with requirements for "Office Samples", and process transmittal forms for mock-ups to provide a record of activity.

1.07 MOCK-UPS

- A. Exterior Building Mock-up: Before exterior finishes are started and Pre-installation Conference for Envelope and Roofing is held, provide an exterior mock-up for Owner and Architect review and approval of all exterior finish elements, materials and construction manner. Size mock-up to be approximately 6' x 10', of layout provided by Architect. Construct mock-up as detailed in the Contract Documents.
 - 1. Mock-up to incorporate all finish materials and specific details, such as bond, control joints, reveals, etc.
 - 2. Mock-up to incorporate a typical opening with all waterproofing provisions shown in contract documents, such as the subsill pan. Flashing, etc.
 - 3. Contractor to test the mock-up panel assembly for moisture infiltration with hose test prior to construction of the entire envelope in the presence of the Owner and Architect. Any failures will be discussed and resolved prior to incorporation into the building.
 - 4. Contractor to schedule building of mock-up to allow for review and testing and not impact schedule.
 - 5. Mock-up to be maintained on-site until building exterior is complete. Keep mock-up clean until removed from site, coordinate time of removal with Architect.
- B. Room Mock-Ups: Before rough-in for patient care rooms, exam rooms, etc. are started, provide headwall mock-ups for each headwall type on the Enlarged Plans for Owner and Architect review and approval of all rough-in and equipment locations. Mock-up to be constructed as detailed in the Construction Documents.

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1. Incorporate in mock-up all devices on the headwall and clearly note each location, including that of equipment, medical gas outlets, electrical outlets, communication outlets, low voltage outlets, switches, lights, etc.
2. Mock-up all walls and ceiling of operating and procedure type rooms.

1.08 CERTIFICATIONS OF COMPLIANCE

- A. Contractor shall submit "Certificates of Compliance" certifying that all materials used in the Work comply with all specified provisions thereof.
 1. Submit in the form of a letter or company standard forms.
 2. Include data or dates of testing and results of testing.

1.09 TEST REPORTS

- A. Test reports certified by an independent testing laboratory must be made available upon request by Architect.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01-4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance.
- B. References and standards.
- C. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- D. Contractor's design-related professional design services.
- E. Control of installation.
- F. See Section 01-4529 and the Drawings for specific test and inspection requirements
- G. Defect Assessment.

1.02 DEFINITIONS

- A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- B. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- C. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

- D. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
 - 1. See Section 01-3323 for additional requirements.
- E. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.03 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
 - 1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
 - 1. Structural Design of Cover: As described in Section 10-7316 - Protective Covers.
 - 2. Sprinkler Layout: Coordinate with ceiling installation, detailed pipe layout, and hydraulic calculations as described in Section 21-1300 - Fire-Suppression Sprinkler Systems.

1.04 REPORTS AND DOCUMENTS

- A. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor. See Section 01-4529.
 - 1. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- B. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.06 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
 - 1. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
 - 2. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
 - 1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
 - 2. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
 - 3. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E548 and E329, and that specializes in types of tests and inspections to be performed.

1.07 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services. The Owner may elect to require the Contractor engage the qualified testing agency on their behalf. See Section 01-4529 - Testing Laboratory Services for reference to who is providing the service.

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1. If not provided in the Contractor's scope, the Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
1. See Section 01-4529 for code compliance testing requirements.
 2. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Testing agency will retest and reinspect corrected work.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

3.03 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
 - 2. Comply with the Contract Document requirements for cutting and patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01-4517
UNCOVERING AND CORRECTION OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The requirements of Section 01-7329 - Cutting and Patching form a part of this section and must be complied with.

1.02 UNCOVERING OF WORK

- A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any Public Authority having jurisdiction require any portion of the Work to be inspected, the Contractor shall give the Architect timely notice of its readiness so that the Architect may observe such inspections.
- B. If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's observation and be replaced at the Contractor's expense without change in the Contract Time.
- C. If a portion of the Work has been covered which the Architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor.
 - 1. If such Work is in accordance with Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner.
 - 2. If such Work is not in accordance with Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

1.03 CORRECTION OF WORK

- A. The Contractor shall promptly correct the Work rejected by the Architect and/or the Public Authority, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed.
- B. The quality of materials and workmanship used in restoring this work shall be in full compliance with the requirements of the Contract Documents.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01-4529
TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Laboratory services required to perform the specified testing shall be performed by an independent testing laboratory employed by the Owner.
- B. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
- C. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.
- D. See Section 01-4000 for quality requirements.
- E. See Section 01-2100 for use of Testing Allowance.

1.02 QUALIFICATION OF LABORATORY

- A. Laboratory shall meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.
- B. Laboratory shall be authorized to operate in the State in which the Project is located.

1.03 LABORATORY REPORTS

- A. After each inspection and test, Laboratory shall submit the laboratory report to the Architect, Contractor, Owner, Structural Engineer, and Civil Engineer within 10 business days.
- B. Each report shall include:
 - 1. Date issued.
 - 2. Project Title and number.
 - 3. Testing laboratory name, address and telephone number.
 - 4. Name of laboratory inspector and job number.
 - 5. Date and time of sampling or inspection.
 - 6. Record of temperature and weather conditions.
 - 7. Date of test.
 - 8. Identification of specification section.
 - 9. Location of sample or test in the Project.
 - 10. Type of inspection or test and Identification of Testing Standard Specified and Used
 - 11. Results of tests and compliance with Contract Documents.
 - 12. Interpretation of test results.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 LABORATORY RESPONSIBILITIES

- A. Laboratory shall provide qualified personnel at site after due notice and cooperate with Architect and Contractor in performance of services.
- B. Laboratory shall perform specified inspection, sampling, and testing of products in accordance with specified standards.
- C. Laboratory shall ascertain compliance of materials and mixes with requirements of Contract Documents.
- D. Laboratory shall promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
- E. Laboratory shall perform additional inspections and tests required by Architect.
- F. Laboratory shall attend preconstruction conferences.

3.02 LIMITS ON TESTING LABORATORY AUTHORITY

- A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of the Work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop Work.

3.03 CONTRACTOR RESPONSIBILITIES

- A. Cooperate with laboratory personnel, and provide access to Work.
- B. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
- C. Notify Architect and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.
 - 1. When tests or inspections cannot be performed after such notice, Contractor shall notify the laboratory.
 - 2. If Contractor does not notify laboratory before laboratory personnel are scheduled for this work, Contractor shall reimburse the Owner for laboratory personnel and travel expenses.

3.04 CODE COMPLIANCE TESTING

- A. The following construction components are to be tested or otherwise approved per 2012 International Building Code, Chapter 17:
 - 1. Structural Components: See Structural Drawings for details on the testing of the following components.

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- a. Concrete Construction
 - b. Wood Construction
 - c. Soils
- B. The following are envelope tests and are to be tested per the following standards with the noted modifications:
1. General:
 - a. Quantities and locations to be tested:
 - 1) Initial testing to be completed on the following quantities for each test:
 - (a) Windows of each type: 5%, with no less than 2
 - (b) Penetrations: 5%, with no less than 2
 - (c) Wall area: 100 sf
 - 2) If initial testing fails on any portion, the failing portion as well as an additional area as follows are to be tested:
 - (a) Windows: 5% , with no less than 1
 - (b) Penetrations: 5%, with no less than 1
 - (c) Walls: 100 sf
 - 3) If additional tests fails, testing on total initial and additional locations to be continued until all pass.
 2. Exterior Wall Without Cladding: Windows are to be installed with initial sealant and flashing work complete with connection to air and water barrier. Building to be water-tight.
 - a. Exterior Walls: Test installed window, penetrations and wall for water leakage in accordance with ASTM E 1105 the following modifications:
 - 1) No air chamber to be used
 - 2) Perform on a wall area in lieu of window.
 - 3) Soak for a minimum of 1 hour.
 - b. Exterior Windows: Test installed wall for water leakage in accordance with ASTM E1105 with the specified lab certification test pressures, but not less than a uniform test pressure difference of 2.86 pound-force per square foot.
 - 1) No air chamber to be used
 - 2) Perform on a wall area in lieu of window.
 - 3) Soak for a minimum of 1 hour.
 3. Exterior Wall With Cladding:
 - a. Exterior Wall and Windows: Test installed windows, penetrations and wall for water leakage in accordance with AAMA 501.2 hose test.
 - b. Exterior Windows: Test installed wall for water leakage in accordance with ASTM E1105 with the specified lab certification test pressures, but not less than a uniform test pressure difference of 6.00 pound-force per square foot.
 4. Roof:
 - a. Penetrations: Spray penetrations with 30-25 psi of water for a minimum of 10 minutes.
 - b. Roof System: Test entire roof system with infrared scan at night to detect wet insulation per ASTM C1153.
 5. Sealant: Test 10% of openings per ASTM C1521.

- C. The following are civil tests and are to be tested per the associated specification sections:
1. Stone base compaction for paving
 2. Water and sewer system distribution testing

3.05 ADDITIONAL CODE COMPLIANCE TESTING

- A. Additional inspections and tests required by local codes or ordinances, or by a plan approval authority having jurisdiction over the project site, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless noted above or otherwise provided in the Contract Documents.

3.06 PAYMENT FOR TESTING

- A. Specified Testing Services:
1. Initial test will be paid for by the Owner.
 2. When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting and repair work occasioned by the non-compliance shall be performed by the same testing agency and the costs thereof will be deducted by the Owner from the Contract Sum.
- B. Contractor's Convenience Testing:
1. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

END OF SECTION

SECTION 01-5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.

1.02 GENERAL REQUIREMENTS

- A. Location: Locate temporary facilities to preclude interference with work and as directed.
- B. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- C. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - 2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

1.03 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. New permanent facilities may be used.
- C. Use trigger-operated nozzles for water hoses, to avoid waste of water.
- D. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work, and for areas accessible to the public.

1.04 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.
- C. At end of construction, return facilities to same or better condition as originally found.

1.06 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.
- B. Provide and operate drainage and pumping equipment. Maintain excavations and site free of standing water.

1.07 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, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular gates with locks.

1.09 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.

1.10 SECURITY

- A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.11 TEMPORARY FIRE PROTECTION

- A. Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses.
- B. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than 1 extinguisher on each floor at or near each exit.
- C. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, exits and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
- D. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
- E. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

1.12 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Designated existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.13 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.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or not later than Substantial Completion.
- B. Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

TEMPORARY FACILITIES AND CONTROLS 01-5000 - 4
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- C. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- D. Clean and repair damage caused by installation or use of temporary work.
- E. Restore existing facilities used during construction to original condition.
- F. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

2.01 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
- B. Heating Units: Provide as required by CFR 29, 1926 OSHA Construction Industry Regulations, Section 1926.154, Temporary Heating Devices.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01-6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Procedures for Owner-supplied products.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. See Section 01-4000 - Quality Requirements, for additional source quality control requirements.

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.

2.03 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 OWNER-SUPPLIED PRODUCTS

- A. See Section 01-1000 - SUMMARY OF WORK for identification of Owner-supplied products.

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. Require supplier to package products in boxes or crates for protection during shipment. Protect sensitive products against exposure to elements and moisture.
- G. Protect sensitive equipment and finishes against impact, abrasion and other damage.
- H. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- I. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- J. 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.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- B. Store and protect products in accordance with manufacturers' instructions, including temperature and humidity ranges.
- 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. Provide off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Do not store products directly on the ground.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

- K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

3.04 PROTECTION AFTER INSTALLATION

- A. Provide substantial coverings to protect installed products from damage from subsequent operations. Remove when no longer needed, prior to completion of work.
- B. Control traffic to prevent damage to equipment and surfaces.
- C. Provide coverings to protect finished surfaces from damage.
- D. Cover projections, wall corners, jambs, sills and soffits of openings, in areas used for traffic and passage of products in subsequent work.
- E. Protect finished floors and stairs from dirt and damage.
- F. In other areas subject to foot traffic, secure heavy paper, sheet goods on the materials in place.
- G. For movement of heavy products, lay planking or similar materials in place.
- H. Waterproofed and roofing surfaces:
 - 1. Prohibit use of surfaces for traffic of any kind, and for storage of any products.
 - 2. When some activity must take place in order to carry out the Contract, obtain recommendations of the installer for protection of surface.
 - 3. Install recommended protection and remove on completion of that activity.
 - 4. Restrict the use of adjacent unprotected areas.
- I. Prohibit traffic of any kind across planted lawn and landscaped areas.

END OF SECTION

SECTION 01-7329
CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section modifies the General Conditions to include incidental requirements and limitations for cutting, fitting and patching required to complete the Work, or make its several parts fit together.

1.02 ADVANCED WRITTEN REQUESTS

- A. Submit written request in advance of cutting or alteration work which affects the following:
1. Structural integrity of any element of the Project.
 2. Integrity of weather-exposed or moisture-resistant element.
 3. Efficiency, maintenance or safety of any operational element.
 4. Visual qualities of sight-exposed elements.
 5. Work of Owner or separate contractor.
- B. Include the following in each written request:
1. Identification of Project.
 2. Location and description of affected work.
 3. Necessity for cutting or alterations.
 4. Description of proposed work, and materials and products to be used.
 5. Alternative to cutting and patching.
 6. Effect on work of Owner or separate contractor.
 7. Written permission of the affected separate contractor.
 8. Date and time the work will be executed.

1.03 QUALITY ASSURANCE

- A. General: Employ skilled workmen or firms qualified to perform cutting and patching specified in this section. Proceed with cutting and patching at the earliest feasible time and complete without delay.
- B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
- C. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction exposed on exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic or visual qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction which was cut and patched in a visually unsatisfactory manner.

- E. Warranty or Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void required or existing warranties.

1.04 DESCRIPTION

- A. Install Work in such a manner and sequence as to preclude or minimize cutting and patching of new Work.
- B. Execute cutting, fitting or patching of Work, required to:
 - 1. Make several parts fit properly.
 - 2. Uncover Work to provide for installation of ill timed Work.
 - 3. Remove and replace defective Work.
 - 4. Remove and replace non-conforming Work.
 - 5. Remove samples of installed Work for testing.
 - 6. Install specified Work in existing construction.
 - 7. Provide rerouting penetrations of non-structural surfaces for installation of piping and electrical conduit.
- C. Do not cut building framing members or modify the foundation without written approval or consent of Architect.
- D. Be responsible for damage resulting from violation of these provisions.
- E. Use only firms or individual trades qualified to perform Work required under this Section.

1.05 JOB CONDITIONS

- A. Before start of Work, obtain and pay for all permits required by all authorities having jurisdiction and notify all interested utilities companies.
- B. Obtain approval of Owner and authorities having jurisdiction for Work which affects existing exitways, exit stairs, means of egress, or access to, or exit from, areas.
 - 1. Review with and obtain approval of authorities for any temporary construction which affects such areas.
- C. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Avoid cutting existing utilities, pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until alternate provisions have been provided.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Types: New materials and products of types and quality identical to existing materials.
- B. For exposed surfaces, use materials that visually match existing adjacent surfaces.

- C. Use materials whose installed performance will equal or surpass that of existing materials.
- D. Comply with specifications for type of Work to be performed.

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to the bid, Contractor shall review all existing facilities that are related to this contract and shall be familiar with all utility requirements and construction.
 - 1. Existing facility documents may be available through the Owner for review.
- B. Perform preliminary investigations as required to ascertain extent of Work.
 - 1. Conditions which would be apparent by such investigation will not be allowed as cause for claims for extra costs.
- C. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
- D. Before proceeding, meet at Project Site with parties involved in cutting and patching, including mechanical and electrical trades.
 - 1. Review areas of potential interference and conflict.
 - 2. Coordinate procedures and resolve potential conflicts before proceeding.
- E. After uncovering existing conditions for Work, inspect conditions affecting installation of new products or Work.

3.02 PREPARATION

- A. Provide adequate shoring, bracing and support as required to maintain structural integrity of Project.
- B. Provide protection from elements for other portions of Project which may be affected.
- C. Erect and maintain waterproof closures for exterior openings. Maintain excavations free of water.
- D. Erect and maintain dustproof partitions as required to prevent spreading of dust, fumes and smoke to other parts of the building.

3.03 CUTTING AND REMOVAL - GENERAL

- A. Execute fitting and adjustment to provide finished installation to comply with specified tolerances and finishes.
- B. Execute cutting by methods which will prevent damage to existing or other Work and will provide proper surfaces to receive installation of new Work.
- C. Neatly cut and remove materials, and prepare all openings to receive new Work.
- D. Concrete or masonry shall be removed in small sections.
- E. Provide shoring, bracing, and other supports to prevent movement, settlement, or collapse of remaining or adjacent wall areas, structure, or facilities.
- F. Arrange shoring, bracing, and supports to prevent overloading of structure.

- G. Take all precautions necessary to prevent damage to existing remaining work or to adjacent facilities.
- H. Use methods which will prevent interference with use of remaining and adjacent facilities.

3.04 MATCHING AND PATCHING

- A. Where walls, ceilings, floors or partitions are removed, repair abutting walls, ceilings or floors disturbed by removal.
- B. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- C. Use methods and materials similar in appearance, and equal in quality to areas or surfaces being repaired.
- D. Patch Work must in every way possible match existing work and adjacent surfaces.
- E. Re-finish entire surfaces as necessary to provide an even finish to match adjacent finishes.
 - 1. Continuous surfaces; to nearest intersections.
 - 2. Assembly - entire refinishing.

END OF SECTION

SECTION 01-7400
CLEANING AND WASTE MANAGEMENT

PART 1 GENERAL

1.01 SITE MAINTENANCE

- A. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.
- B. Keep streets clean from mud, dirt, debris, and other materials removed from the job site.
- C. At completion of work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials. Clean all sight-exposed surfaces.
- D. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on project site.
 - 2. Do not dispose of volatile waste such as mineral spirits, oil, and paint thinner in storm drains or sanitary sewers.
- E. Hazard Control:
 - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
 - 2. Prevent accumulation of waste which might cause hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile and noxious substances.

1.02 PROGRESS CLEANING

- A. Keep building, grounds, and public properties free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to prevent dust.
- C. During progress of Work, clean site and public properties and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris, and rubbish.
- E. Vacuum interior building areas, where work is performed prior to painting and other finish work.
- F. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, new painted surfaces.

1.03 FINAL CLEANING

- A. Employ experienced workmen or professional cleaners for final cleaning.
- B. In addition to removal of debris and cleaning specified in other sections, clean interior and exterior exposed-to-view surfaces.
- C. Remove temporary protection and labels not required to remain.
- D. Clean finishes free of dust, stains, films and other foreign substances.

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- E. Clean transparent and glossy materials to a polished condition; remove foreign substances. Polish reflective surfaces to a clear shine.
- F. Vacuum clean carpeted and similar soft surfaces.
- G. Clean resilient and floor finishes as specified.
- H. Clean surfaces of equipment; remove excess lubrication.
- I. Clean plumbing fixtures to a sanitary condition.
- J. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers, and coils when units have been operated without filters during construction.
- K. Clean light fixtures and lamps.
- L. Remove debris, rubbish, dirt, etc. from open concealed spaces, chases and above ceilings.
- M. Repair, patch, and touch-up marred surfaces to specified finish and to match adjacent surfaces.
- N. Remove waste, foreign matter, and debris from roofs and drainage systems.
- O. Remove waste, debris, and surplus materials from site. Clean grounds; remove stains, spills, and foreign substances from paved areas and sweep clean. Rake clean other exterior surfaces.
- P. Maintain cleaning until Final Completion.
- Q. Prior to Final Completion, or Owner occupancy, Contractor shall conduct an inspection of sight exposed interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01-7700
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SUBSTANTIAL COMPLETION

- A. When Work is considered to be substantially complete, submit the following to Architect:
 - 1. Written notice that the Work, or designated portion, is substantially complete.
 - 2. List of items to be completed or corrected (Contractor's punch list).
- B. Within a reasonable time, Architect will inspect to determine status of completion, and compile a punch list of items to be completed and corrected. If Architect determines that Work is not substantially complete, he will immediately notify Contractor in writing. Architect will generally point out his reasons, but he will not be obligated to give an exhaustive list of discrepancies.
- C. Contractor's Duties: Remedy deficiencies and send Architect another written Notice of Substantial Completion.
 - 1. If the Contractor calls for the inspection by the Architect and/ or Engineer and the Work is deemed as incomplete, the Contractor shall be responsible for travel expenses and professional fees associated with the trip.
- D. Architect's Actions:
 - 1. Reinspect the Work.
 - 2. When Architect considers Work substantially complete, he will issue the Certificate of Substantial Completion.

1.02 AGENCY INSPECTIONS

- A. When Work is considered to be substantially complete, the Contractor shall schedule inspections by all applicable authorities having jurisdiction. The Contractor shall notify the Owner and Architect of the anticipated date of these inspections, and further advise of any action needed by Owner and Architect to facilitate these inspections.
- B. An inspection by the state and local authorities having jurisdiction will be required following Substantial Completion and prior to Owner Occupancy. The Contractor shall notify the Architect approximately 30 days prior to the desired inspection date so that the Architect may schedule this inspection. The Contractor is responsible for scheduling the state fire marshal inspection. The Contractor shall have the documentation complete and in good order to review during the inspection, including, but not limited to:
 - 1. Certificate of Compliance or Occupancy issued by the local building official.
 - 2. Certification of Compliance issued by the state fire marshal.
 - 3. Sprinkler Certification.
 - 4. Fire Alarm Installation Certification. (Applicable State form, completed by Fire Alarm Installer.)
 - 5. Mechanical, Electrical Systems Certification.
 - 6. Final Test & Balance Report.

1.03 OWNER OCCUPANCY

- A. Owner's Action: Occupy the Project, or designated portion of the Project, in accordance with provisions of the Certificate of Substantial Completion.
- B. Contractor's Duties:
 - 1. Obtain Certificate of Occupancy if required by local building codes authority.
 - 2. Obtain consent of insurance company or companies to keep insurance in force during partial occupancy by Owner.
 - 3. Make corrections listed on punch list attached to Certificate of Substantial Completion.
 - 4. Perform final clean-up.

1.04 FINAL COMPLETION

- A. When Work is considered to be complete, Contractor shall submit certification indicating the following:
 - 1. Contract Documents have been reviewed and Work has been inspected for compliance with those Documents.
 - 2. Work has been completed in accordance with Contract Documents.
 - 3. All punch list items have been corrected.
 - 4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
 - 5. Work is complete and ready for final inspection.
- B. Architect's Actions During Final Inspection:
 - 1. Inspect to verify the status of completion with reasonable promptness.
 - 2. If he considers Work incomplete or defective, he will promptly notify Contractor in writing, listing deficiencies.
- C. Contractor's Duties: Take immediate action to correct deficiencies, and send certification to Architect that Work is complete.
- D. When Architect determines that Work is acceptable, he will request Contractor to make closeout submittals.

1.05 REINSPECTION FEES

- A. Should status of completion of work require reinspection by Architect due to failure of work to comply with Contractor's claims on initial inspection, Owner will deduct the amount of Architect compensation for reinspection services from final payment to Contractor.

1.06 CONTRACTOR'S CLOSEOUT SUBMITTALS REQUIRED

- A. Documents required by State Licensure inspectors and other authorities having jurisdiction.
- B. Comply with Section 01-7800 for the following:
 - 1. Project Record Documents.
 - 2. Operation and Maintenance Data.

3. Product Warranties and Bonds.
- C. Keys and Keying Schedule: Comply with Section 08-7100.
- D. Evidence of Payment and Release of Liens: Comply with requirements and Conditions of the Contract.
- E. Consent of Surety to Final Payment.
- F. Certificates of Insurance for Products and Completed Operations: Comply with Supplementary Conditions.
- G. Test Results: Complete, dated test results of various systems signed by person authorized to sign for a qualified testing agency which conducted tests.
- H. Provide products, spare parts and maintenance materials in quantities specified in each section, in addition to that used for construction of the work.
 1. Coordinate with Owner; deliver to Project Site and obtain receipt to include with final payment.

1.07 STATEMENT OF ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement to Architect indicating all adjustments to the Contract Sum. Include the following:
 1. Original Contract Sum.
 2. Previous change orders.
 3. Changes under allowances.
 4. Deductions for uncorrected work.
 5. Deductions for reinspection fees.
 6. Other adjustments to Contract Sum.
 7. Total Contract Sum, as adjusted.
 8. Previous payments.
 9. Sum remaining due.
- B. If required, a final Change Order will be prepared reflecting approved adjustments to Contract Sum which were not previously made on Change Orders.

1.08 FINAL APPLICATION FOR PAYMENT

- A. Submit final Application for Payment in accordance with procedures and requirements of the Conditions of the Contract.

1.09 FINAL PAYMENT

- A. If the final payment is materially delayed through no fault of the Contractor, the Owner may issue a semi-final payment.

1.10 POST-CONSTRUCTION INSPECTION

- A. Prior to expiration of one year from the Date of Substantial Completion, the Architect will make a visual inspection of the Project to determine whether correction of Work is required, in accordance with the Conditions of the Contract.

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- B. The Architect will promptly notify the Contractor, in writing, of any observed deficiencies. Contractor shall then correct deficiencies promptly.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01-7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment. Submit in PDF form.
 - 1. Record Drawings.
 - 2. Site Survey.
- B. Operation and Maintenance Data:
 - 1. Submit a copy of preliminary draft or proposed formats and outlines of contents before Substantial Completion. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within 10 days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form and a PDF copy within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. Submit a copy of preliminary draft or proposed formats and outlines of contents before Substantial Completion. Architect will review draft and return one copy with comments.
 - 2. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 3. Make other submittals in PDF form within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 4. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.
- D. Spare Parts and Maintenance Materials:
 - 1. Deliver to Owner prior to substantial completion unless Owner requests earlier delivery.
 - 2. Deliver to location directed by Owner.

3. Signed transmittal to indicate that spare parts and extra stock were delivered to the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Project Manual: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
 4. Other items installed but not originally specified.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.
 6. Fixed equipment.
- G. Site Survey: General Contractor shall include with Record Document Submittal a certificate and drawing, from a surveyor licensed in the state in which the project is located, verification of the building location, first floor elevation, accessible route, site layout, and topography.
 1. Accessible route survey portion to include documentation that the accessibility slopes are not greater than slopes indicated on project documents, and that the widths and lengths of the ramps indicated are considered minimums per governing codes.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.

- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Include test and balancing reports.
- N. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

- H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Original warranties and bonds.

3.06 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment, and systems.
- B. For each item, record the following information:
 - 1. Time and date of instruction.
 - 2. Name(s) of personnel providing instruction.
 - 3. Name(s) of personnel receiving instruction.
 - 4. Items covered during instructions.
- C. Use operating and maintenance manual to constitute the basis of instruction.
 - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

3.07 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

3.08 SPARE PARTS AND TOOLS AND MAINTENANCE MATERIALS

- A. Package in clearly identified boxes.
 - 1. Indicate manufacturer's name, part name and stock number.
 - 2. Indicate piece of equipment part or tool is for.
 - 3. Indicate name, address and phone number of closest supplier.

3.09 EXTRA MATERIALS

- A. Package in clearly identified containers, or install where indicated.
 - 1. Indicate trade name, stock number, size, color, etc.
 - 2. Indicate name, address and phone number of closest supplier.
 - 3. See individual specification sections for quantity required.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.
- B. Related Sections include the following:
 - 1. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
 - 1. Cementitious materials and aggregates.
 - 2. Form materials and form-release agents.
 - 3. Steel reinforcement and reinforcement accessories.
- F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Form materials and form-release agents.
 - 3. Steel reinforcement and reinforcement accessories.

4. Admixtures.
5. Waterstops.
6. Curing materials.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Epoxy joint filler.
12. Joint-filler strips.
13. Repair materials.

- G. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 301, "Specification for Structural Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.
1. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1.
 - 2. See architectural drawing for special form finishes.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.
 - 2. Furnish ties with integral water-barrier plates for concrete required to be water tight.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60 deformed.
- B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
- B. Portland Cement: ASTM C 150, Type V.
 - 1. Fly Ash: ASTM C 618, Class C or F.
- C. Normal-Weight Aggregate: ASTM C 33, uniformly graded.
- D. Lightweight Aggregate: ASTM C330.
- E. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints.
 - 1. Profile: As indicated.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. PVC Waterstops:
 - a. Greenstreak.
 - b. Meadows: W. R. Meadows, Inc.
 - c. Murphy: Paul Murphy Plastics Co.
 - d. Tamms Industries Co.; Div. of LaPorte Construction Chemicals North America, Inc.
 - e. Vinylex Corporation.
 - f. Westec Barrier Technologies; Div. of Western Textile Products, Inc.
- C. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.

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1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
 - b. Conseal CS-231; Concrete Sealants Inc.
 - c. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
 - d. Hydrotite; Greenstreak.
 - e. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.

2.7 VAPOR RETARDERS

- A. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 sieve and 10 to 30 percent passing a No. 100 sieve; meeting deleterious substance limits of ASTM C 33 for fine aggregates.
- C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.8 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- G. Products: Subject to compliance with requirements, provide one of the following:
 1. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound:
 - a. Spray-Cure & Seal Plus; ChemMasters.
 - b. Lumiseal Plus; L&M Construction Chemicals, Inc.
 - c. CS-309/30; W. R. Meadows, Inc.
 - d. Cure & Seal 31 percent UV; Symons Corporation.
 - e. Masterkure-N-Seal HS; ChemRex/MBT.
 2. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:
 - a. Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).

- b. Polyseal WB; ChemMasters.
- c. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
- d. Vocomp-30; W. R. Meadows, Inc.
- e. Masterkure-N-Seal W; ChemRex/MBT/.

2.9 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- B. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements:
- C. Reglets: Fabricate reglets of not less than 0.0217 inch thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- D. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inches (thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
- D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Combined Fly Ash and Pozzolan: 25 percent.
- E. Maximum Water-Cementitious Materials Ratio: 0.50 for concrete required for foundations.
- F. Maximum Water-Cementitious Materials Ratio: 0.40 for slabs on grade.
- G. Maximum Water-Cementitious Materials Ratio: 0.45 for all other concrete.
- H. Air Content Non-Exposed Concrete: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2 to 4 percent, unless otherwise indicated.
- I. Air Content Exposed Concrete: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1½ or minus 1½ percent, unless otherwise indicated:
 - 1. Air Content: 5.5 percent for 1½ inch nominal maximum aggregate size.

2. Air Content: 6 percent for $\frac{3}{4}$ inch nominal maximum aggregate size.
- J. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.
- K. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- L. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 2. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Construct forms tight enough to prevent loss of concrete mortar.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 1. Do not use rust-stained steel form-facing material.
- E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- G. Chamfer exterior corners and edges of permanently exposed concrete.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.
 - 2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. 28-day design compressive strength.
 - 2. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.
 - 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be loaded above its allowable design load.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

- A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
 - 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

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5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/4-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface. Do not wait overnight before cutting joints.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 2. Do not use vibrators to transport concrete inside forms.

- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1.
- F. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R:

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 - 2. Do not apply rubbed finish to smooth-formed finish.
- C. Rubbed Finish: Apply the following to smooth-formed finished concrete:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.

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1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 2. Finish surfaces to the tolerances noted on drawings, measured within 24 hours according to ASTM E 1155 for a randomly trafficked floor surface.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

- a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

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3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

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3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 6. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of five standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. When strength of laboratory-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION

SECTION 03-5400
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Liquid-applied self-leveling floor underlayment.
 - 1. Use cementitious type at existing concrete substrates in areas requiring level floor for installation of vinyl tile, sheet vinyl, and carpeted floor finishes..
- B. Floor underlayment primer.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Product Data: Describing material, mixing and methods of application.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Floor underlayment shall be supplied by a firm regularly engaged in the production of cementitious, non-structural underlayment materials.
- B. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.
- C. Do not use cement which shows indications of moisture damage, caking or other signs of deterioration. Damaged or deteriorated materials shall be removed from the premises.

1.05 FIELD CONDITIONS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.
- C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Cementitious Underlayment:
 - 1. ARDEX Engineered Cements; ARDEX V 1200 with ARDEX P51 Primer: www.ardexamericas.com/#sle.
 - 2. Maxxon, www.maxxon.com
 - 3. USG Levelrock, www.levelrock.com

4. Master Builders, Inc., www.buildingsystems.basf.com
5. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.02 MATERIALS

- A. Cast Underlayments, General:
 1. Comply with applicable code for combustibility or flame spread requirements.
- B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
 1. Compressive Strength: Minimum 4000 pounds per square inch after 28 days, tested per ASTM C109/C109M.
 2. Flexural Strength: Minimum 1000 psi after 28 days, tested per ASTM C348.
 3. Self-Leveling Time: 15 minutes at 65 deg F.
 4. Initial Set Time: Approximately 2 hours at 65 deg F.
 5. Final Set Time: Approximately 3 hours at 65 deg F.
 6. Tensile Bond Strength: Approximately 163 psi at 28 days.
 7. Coverage: 25 square feet at 1/4" in thickness.
- C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.
- D. Primer: Manufacturer's recommended type.
- E. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.03 MIXING

- A. Site mix materials in accordance with manufacturer's instructions.
- B. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

- A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.
- B. Comply with manufacturer's instructions for preparation of substrate. Verify that penetrations and expansion joints are in place and secured and that floor drains are properly clamped in position.
- C. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

- D. Vacuum clean surfaces. Clean substrate of dust, debris, oil, sealers, curing compounds, paint, polymer coatings or other foreign (bond breaking) matter.
- E. Prime substrate in accordance with manufacturer's instructions. Allow to dry.
- F. Close floor openings. Fill cracks and voids with calking to prevent seepage during underlayment placement.
- G. Allow expansion joints to continue through the underlayment at the same width.

3.03 APPLICATION

- A. Application of cementitious underlayment shall not begin until the building is enclosed, including roof, windows, and drywall taped.
- B. Install underlayment in accordance with manufacturer's instructions.
- C. Underlayment shall be placed at a fluid consistency and pumped to a thickness of not greater than 1/2" (unextended) in all areas noted on drawings. Extend underlayment with the use of 15 lbs. well graded, washed, 1/8" top size, clean sand.
- D. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.
- E. Place before partition installation.
- F. Windows and doors in areas receiving underlayment shall be closed during and following application. Apply water-based sealer if underlayment will be exposed to the elements.
- G. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.04 CURING

- A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.
- B. Air cure in accordance with manufacturer's instructions.

3.05 PROTECTION

- A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.
- B. Do not permit traffic over unprotected floor underlayment surfaces for a minimum of 24 hours following application.

END OF SECTION

SECTION 04-2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and Grout.
- C. Reinforcement and anchorage.
- D. Accessories.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Certification: From concrete masonry unit manufacturer and distributor certifying the units delivered to job-site meet the requirements of this section.
 - 2. Manufacturer's Product Data: Indicating full compliance with requirements of this section, for each of the following:
 - a. Horizontal joint reinforcement.
 - b. Premixed Mortar (data is required if used).
 - c. Grout materials.

1.03 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Concrete masonry units shall be obtained from one manufacturer.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- E. Installers: At least one skilled journeyman mason shall be present at all times during masonry work to personally supervise work of this section.

1.04 PRE-INSTALLTION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Cracked, chipped and spalled masonry units shall be immediately removed from job-site.

- C. Mortar materials shall be delivered to job-site in original unopened packages bearing manufacturer's labels in accordance with Section 01-6000.
- D. Store and protect masonry units and mortar materials in accordance with manufacturer's recommendation and Section 01-6000.
 - 1. Maintain temperature and humidity within ranges required by manufacturer's instructions.
 - 2. Maintain cementitious materials and aggregates clean, dry and protected against dampness, freezing and foreign matter.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C90, normal weight.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I.
- B. Masonry Cement: Not permitted.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
 - 1. For color consistency in mortar, sand shall be from a single source. Do not change source during the course of the work
- E. Grout Aggregate: ASTM C404.
- F. Calcium Chloride: Not permitted.
- G. Water: Clean and potable.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Blok-Lok Limited: www.blok-lok.com.
 - 2. Hohmann & Barnard, Inc: www.h-b.com/sle.
 - 3. WIRE-BOND www.wirebond.com/#sle.
 - 4. Substitutions: See Section 01-2513 Product Substitution Procedures.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; galvanized.
- C. Prefabricated Corners and Tees: Required for each type of wall reinforcement.

2.04 FLASHINGS

- A. Metal Flashing Materials: As specified in Section 07-6200, installed as part of the work of this section.

- B. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

2.05 ACCESSORIES

- A. Sealant and Backer Rods: Exterior quality specified in Section 07-9005.
 - 1. Color: To match mortar color.
- B. Preformed Control Joints: Neoprene material with 70 durometer hardness conforming to ASTM D2240. Provide with corner and tee accessories, fused joints. 3/8" x 3" x length required, compression up to 35%, closed cell neoprene conforming to ASTM D1056, designed for use in control joints in solid or cavity wall construction to provide resilient resistance to cracking under stress of expansion and contraction.
 - 1. Size and Configuration: As required for compliance with drawings.
 - 2. Manufacturers:
 - a. Blok-Lok Limited: www.blok-lok.com.
 - b. Hohmann & Barnard, Inc: www.h-b.com/sle.
 - c. WIRE-BOND: www.wirebond.com/#sle.
 - d. Substitutions: See Section 01-2513 Product Substitution Procedures.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 - 1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations, thickness to equal air space.
 - a. Manufacturers:
 - 1) Advanced Building Products, Inc; Mortar Break DT: www.advancedbuildingproducts.com/#sle.
 - 2) Mortar Net Solutions; Mortar Net with Insect Barrier: www.mortarnet.com.
 - 3) Substitutions: See Section 01-2513 Product Substitution Procedures.
- D. Weeps and Cavity Vents:
 - 1. Type: Polyester mesh.
 - 2. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/sle.
 - b. Mortar Net Solutions; Mortar Net CellVent: www.mortarnet.com/#sle.
 - c. WIRE-BOND: www.wirebond.com.
 - d. Substitutions: See Section 01-2513 Product Substitution Procedures.
 - 3. Color: Clear
- E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Masonry below grade and in contact with earth: Type S.

- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 1. Fine Grout for Reinforced Masonry: Fine aggregate only ready mix concrete, 3000 psi.
 - 2. Course Grout for Reinforced Masonry: Pea gravel ready mix concrete, 3000 psi.
 - 3. See specification section 03-3000 for specification and submittal requirements.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- C. Do not proceed with concrete masonry unit work until unsatisfactory conditions have been corrected.
- D. Do not use cracked and chipped concrete masonry units.
- E. Use dry concrete masonry units. Frozen and wet concrete masonry units are not acceptable.
- F. No conduit may be run outside the thermal envelope that then turns back inside the thermal envelope.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:

1. Bond: Running.
2. Mortar Joints: Concave, unless otherwise noted.
3. Joint Size: 3/8"

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Hold 1/4" space between jambs and sills of windows, doors and other openings for sealant.

3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.
- B. Install cavity vents in veneer walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 MORTAR AND GROUT MIXING

- A. Thoroughly mix mortar and grout ingredients in quantities needed for immediate use in accordance with ASTM C270.
- B. Do not use anti-freeze compounds to lower freezing point of mortar and grout.
- C. If water is lost by evaporation, retemper within two hours of mixing. Do not retemper mortar and grout after two hours of mixing.

3.09 REINFORCEMENT AND ANCHORAGE - GENERAL AND CAVITY WALL MASONRY

- A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.
- B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (whichever is greater).
- C. Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10'.
 - 1. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.
- D. Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing shown.
- E. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
- F. Provide not less than minimum lap indicated or, if not shown, as required by governing code.
- G. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- H. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- I. Place continuous joint reinforcement in first and second joint below top of walls.
- J. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- K. Lap joint reinforcement ends minimum 6 inches.
- L. Corners & Intersections: Fully reinforce with prefabricated corners and ties. Place in first block joint, then every second block joint.

3.10 MASONRY FLASHINGS

- A. All flashing installation shall comply with Sections 07-6200 and 07-2726.
- B. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- C. Terminate flashing up 8 inches minimum on vertical surface of backing:
1. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
 2. Apply additional layer of air and water barrier or cap bead of copatable sealant on top edge of self-adhered flashing.

3.11 REINFORCED WALLS

- A. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
- B. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
- C. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
- D. Option: Where all vertical cores are not shown to be grouted, Contractor may elect to fill all vertical cores with grout. In which case, requirements for mortar bedding of cross-webs and closing of core spaces below bond beams do not apply.

3.12 GROUTED COMPONENTS

- A. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
- B. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.
- C. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 5'. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation. Place grout in lintels or beams over openings in one continuous pour.
- D. Use "Fine Grout" per ASTM C476 for filling spaces less than 3" in one or both horizontal directions.

- E. Use "Course Grout" per ASTM C476 for filling spaces 3" to 10" in both horizontal directions.
- F. Use 3000 psi concrete for filling spaces 10" or larger in both horizontal directions.
- G. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to the requirements which follow.
- H. Low-Lift Grouting:
 - 1. Provide minimum clear dimension of 2" and clear area of 8 sq. in. in vertical cores to be grouted.
 - 2. Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required to allow for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 10 ft.
 - 3. Lay CMU to maximum pour height. Do not exceed 5' height, or if bond beam occurs below 5' height stop pour at course below bond beam.
 - 4. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2" below top course of pour.
 - 5. Bond Beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.
- I. High-Lift Grouting:
 - 1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension is 3" and 10 sq. in., respectively.
 - 2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout.
 - 3. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.
- J. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry.
- K. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

3.13 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Place joints 4 feet to 10 feet from each exterior corner of building.

- E. Place Joints approximately every 25 feet o.c. in uninterrupted walls.
- F. Place joints at abutment of wall and columns.
- G. Install joints at locations where wall height or thickness changes by more than 20%.
- H. Place control or expansion joints in supporting structure.
- I. Keep expansion/control joints free of mortar and other rigid materials.

3.14 BUILT-IN WORK

- A. Install built-in items plumb, level, and true to line.
- B. Do not build into masonry construction organic materials that are subject to deterioration.

3.15 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.16 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution. Do not use acids. Clean blocks thoroughly with wire brush.
- D. Rinse and leave block walls clean and neat.
- E. Properly clean joints scheduled for sealant.

3.17 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- B. Protection During Erection:
 - 1. Maintain protective boards at exposed external corners which may be damaged by construction activities. Provide such protection without damaging completed work.
 - 2. At end of each day's work, cover top of walls with heavy waterproof sheets. Extend sheets 24 inches each side of walls. Secure in place.

3. Cover partially completed structures when work is not in place.
- C. Cold Weather Protection for Work in Progress:
1. When air temperature is from 40 degrees F to 32 degrees F, heat sand and mixing water to produce mortar temperature between 40 degrees F and 120 degrees F.
 2. When air temperature is from 32 degrees F to 20 degrees F, heat sand and mixing water to produce mortar temperature between 40 degrees F and 120 degrees F. Maintain temperature of mortar on boards above freezing.
 3. When daily air temperature is from 25 degrees F to 20 degrees F, completely cover blocks with insulating blankets or similar protections.
 - a. Use salamanders or other heat sources on both sides of walls under construction. Use wind breaks when wind is in excess of 15mph.
 4. When air temperature is 20 degrees F and below, heat sand and mixing water to produce mortar temperatures between 40 degrees F and 120 degrees F.
 - a. Provide enclosures and auxiliary heat to maintain air temperature above 32 degrees F.
 - b. Do not lay masonry units which have surface temperature of 20 degrees F.
 5. Remove ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
- D. Cold Weather Protection for Completed Work:
1. Provide protection as required to maintain minimum 32 degrees F for a minimum of 24 hours.
- E. Remove all masonry units determined to be frozen or damaged by freezing conditions.

END OF SECTION

SECTION 04-2613
MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clay facing brick.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Installation of lintels.
- E. Accessories.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Indicating full compliance with requirements of this section, for each of the following:
 - a. Brick
 - b. Each type of masonry unit tie.
 - c. Premixed mortar, if used.
 - d. Mortar color additive
 - e. Cavity weep/vent
 - f. Through-wall flashing
 - 2. Samples:
 - a. 12" x 12" sample panels showing brick texture, color and color range for each type of face brick required.
 - b. Mortar samples showing range of available colors.
 - c. Cavity weep/vent, 12" x 12" sample.

1.03 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
 - 1. All masonry flashing assemblies shall be installed by masonry craftworkers who have completed the International Masonry Institute (IMI) upgrade training course for Masonry Flashing, or equal."
 - 2. Grouting and Reinforcing: All masonry and grouting and reinforcing work shall be performed by masonry craftworkers who have successfully completed the International Masonry Institute (IMI) training course for Grouting and Reinforced Masonry Construction, or equal.

- D. Each brick type shall be obtained from one manufacturer.
- E. Qualifications of Workmen: A skilled journeyman mason shall be present during brick work to personally supervise work of this section.

1.04 MOCK-UP

- A. Mock-Up Panel: Before work in this section is started, provide exterior mock-up for Owner and Architect review and approval of all exterior finish elements materials and construction manner. Comply with provisions of Section 01-3323.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Bricks shall be delivered to job-site in accordance with manufacturer's recommendations and Section 01-6000.
 - 1. Cracked, chipped and spalled brick units greater than allowed per brick specification shall be immediately removed from job-site.
- B. Store and protect brick units in accordance with manufacturer's recommendation and Section 01-6000.
 - 1. Store units at job-site so that they are off the ground and protected from the elements.
- C. Mortar materials and accessories shall be delivered to job-site in original unopened packages bearing manufacturer's labels and in accordance with Section 01-6000.

1.07 FIELD CONDITIONS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.
- C. At end of day, cover top of walls with heavy waterproof sheets. Extend sheets 24 inches each side of walls. Secure in place.
- D. Cold Weather Protection for Work in Progress:
 - 1. Average daily air temperature from 40 degrees to 32 degrees F: Protect masonry from rain or snow for 48 hours after erection.
 - 2. Average daily air temperature from 32 degrees to 25 degrees F: Cover masonry for 48 hours after erection.
 - 3. Average daily air temperature from 25 degrees to 20 degrees F:
 - a. Provide heat sources on both sides of masonry construction.
 - b. Cover masonry with insulating blankets for 48 hours after erection
 - c. Provide wind breaks when wind is in excess of 15 mph
 - 4. Average daily air temperature below 20 degrees F:

- a. Provide enclosures and auxiliary heat to maintain air temperature above 32 degrees F.
- b. Do not lay masonry units which have surface temperature of 20 degrees F.
- E. Remove ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
- F. Cold Weather Protection for Completed Work:
 - 1. Protect as required to maintain minimum 32 degrees F for a minimum of 48 hours.
- G. Remove all brick determined to be frozen or damaged by freezing conditions.

PART 2 PRODUCTS

2.01 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
 - 1. Color and texture to match existing brick on Hospital.
 - 2. Actual Size: 3-5/8"x3-5/8"x11-5/8" (Utility).
 - 3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
 - 4. Compressive Strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.
 - 5. Efflorescence: When tested in accordance with ASTM C67, brick shall show no efflorescence.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Masonry Cement: Not permitted.
- C. Hydrated Lime: ASTM C207, Type N.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Calcium Chloride: Not permitted.
- G. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1. Color(s): As selected by Architect from manufacturer's full range.
 - 2. Manufacturers:
 - a. Solomon Colors: www.solomoncolors.com/sle.
 - b. Substitutions: See Section 01-2513 Product Substitution Procedures.
- H. Water: Clean and potable.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.

1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
2. Wire ties: Triangular shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 3-1/2 inches.
4. Screws: No. 12 diameter 300 stainless steel or cadmium plated, 1-1/2" minimum length. Galvanized steel is not acceptable.
5. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/sle.
 - b. Masonry Reinforcing Corp. of America (Wire-Bond): www.wirebond.com.
 - c. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.04 FLASHINGS

- A. Membrane Flashing: As specified in Section 07-2726.
- B. Membrane Asphaltic Flashing Materials:
 1. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet; 40 mils (0.040 inch) minimum total thickness; 8 mil cross-laminated polyethylene bonded to adhesive rubberized asphalt, with a removable release liner.
 2. Provide termination bar with attachment at a maximum of 6 inches on center. Air and water barrier tape to cover termination bar.
 - a. Manufacturers:
 - 1) York Manufacturing, Inc; York Seal: www.yorkmfg.com/#sle.
 - 2) GCP Applied Technologies; Perm-A-Barrier Wall Flashing: www.gcpat.com.
 - 3) Hohmann & Barnard; TeXtroflash: www.h-b.com.
 - 4) Substitutions: See Section 01-2513 Product Substitution Procedures.
- C. Termination Bars: Stainless steel; compatible with membrane and adhesives.
- D. Drip Edge: Stainless steel; compatible with membrane and adhesives.

2.05 ACCESSORIES

- A. Compression Joint: 1/4" thick by 3" wide neoprene sponge with adhesive on one side for placing horizontally beneath relieving angles, ASTM D1056.
- B. Anchor Head Coating: Specified in Section 07-2726.
- C. Sealant and Backer Rods: Exterior quality specified in Section 07-9005.
 1. Color: To match mortar color.
- D. Cavity Vents and Weeps:
 1. Type: Molded PVC grilles, insect resistant.
 2. Color(s): As selected by Architect from manufacturer's full range.
 3. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com.
 - b. Masonry Reinforcing Corp. of America (Wire-Bond): www.wirebond.com.
 - c. Heckmann Building Products Inc: www.heckmannbuildingprods.com.
 - d. Substitutions: See Section 01-2513 Product Substitution Procedures.

- E. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 - 1. Mortar Diverter: Panels installed at flashing locations.
 - a. Manufacturers:
 - 1) Advanced Building Products, Inc; MortarBreak DT: www.advancedbuildingproducts.com/#sle.
 - 2) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
 - 3) Substitutions: See Section 01-2513 Product Substitution Procedures.
- F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, Proportion Specification.
 - 1. Masonry below grade and in contact with earth; Type S.
 - 2. Exterior, non-loadbearing masonry; Type N.
- B. Grout: ASTM C476; consistency as required to fill volumes completely for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 1. Fine Grout: Fine aggregate only ready mix concrete, 3000 psi.
 - 2. See specification section 03-3000 for specification and submittal requirements.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Do not use cracked, chipped and spalled brick units.
- E. Use dry bricks. Frozen and wet bricks are not acceptable.
- F. No conduit may be run outside the thermal envelope that then turns back inside the thermal envelope.

3.02 MORTAR

- A. Do not use anti-freeze compounds to lower freezing point of mortar.
- B. If water is lost by evaporation, retemper within two hours of mixing. Discard mortar after two hours of initial mixing.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.

- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Brick Units:
 - 1. Bond: Varies as indicated on drawings.
 - 2. Mortar Joints: Concave.
 - 3. Joint Size: 3/8" unless otherwise indicated.

3.04 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar as work progresses.
- E. Interlock intersections and external corners, except for units laid in stack bond.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

3.05 PROJECTING BRICK COURSES

- A. Use solid brick units for projecting brick courses.
- B. Provide cement wash on horizontal surface (top) of projected brick courses.

3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.
- B. Install cavity vents in veneer walls at 32 inches on center horizontally below shelf angles and lintels and at top of walls.

3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar control panels continuously throughout full length of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.
 - 1. Verify that airspace width is no more than 3/8 inch greater than panel thickness.
 - 2. Hold cavity mortar control panel tight to face wythe.
 - 3. Install horizontally between joint reinforcement.

4. Stagger end joints in adjacent rows.
 5. Fit to perimeter construction and penetrations without voids.
- D. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
1. At cavities over 7", provide space at 16" on center vertically and 24" on center horizontally.
- B. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
- C. Cover heads of brick tie anchors attached to gypsum sheathing with air and water barrier.

3.09 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up at least 1 inch, minimum, to form watertight pan at non-masonry construction.
 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches minimum above the top of mortar control on vertical surface of backing:
1. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
 2. Apply air and water barrier or cap bead of sealant on top edge of self-adhered flashing.
- C. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.
- D. Extend membrane flashings to within 3/4 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

3.10 LINTELS

- A. Install loose steel lintels over openings as noted on the Structural Drawings.

3.11 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.

- B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Place joints 4 feet to 10 feet from each exterior corner of building.
- E. Place joints approximately every 25 feet o.c. in uninterrupted walls.
- F. Place joints at abutment of wall and columns.
- G. Install joints at locations where wall height or thickness changes by more than 20%.
- H. Place control or expansion joints in supporting structure.
- I. At major openings, place joints at end of lintels upward and below at ends of sills downward.
- J. For openings less than 6 feet wide place joints on one side of openings.
- K. For openings more than 6 feet wide place joints at both sides of openings.
- L. Keep expansion/control joints free of mortar and other rigid materials.
- M. Place compression joints to underside of relief angles supporting masonry.

3.12 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.13 CUTTING AND FITTING

- A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.

- D. After mortar is thoroughly set and cured, clean a 20 square foot sample area as follows. Obtain Architect's acceptance of sample cleaning BEFORE proceeding to clean the remainder of brick work.
 - 1. Dry clean sample area to remove large particles of mortar using wood paddles and scrapers. Use non-metallic tools for cleaning operation.
 - 2. Pre-soak brick wall by saturating with water to flush off loose mortar and dirt.
 - 3. Scrub brick wall with stiff brush and a non-acidic solution of type recommended by brick manufacturer which will not harm brick and adjacent surfaces.
 - 4. Remove cleaning solution, dirt and mortar crumbs with pressurized clean water.
 - 5. Cleaning the brick with acid-type cleaning solution is not permitted.
- E. Properly clean joints scheduled for sealant.

3.15 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04-7313
MANUFACTURED MASONRY (CALCIUM SILICATE)

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cast stone for exterior walls where indicated; complete with accessories required for secure and watertight installation.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Product Data: Submit manufacturer's technical data for each type of stone, stonework accessory, and quality of sealant materials.
 - 2. Shop Drawings: Submit drawings indicating sizes, dimensions, sections and profiles of stones; arrangement and provisions for jointing, supporting, anchoring, and details showing relationship with adjacent work.
 - 3. Samples: Submit the following:
 - a. 12" x 12" sample for architect's approval for color and finish of stone required.
 - b. Colored pointing mortar and grout samples.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in fabricating stone material, similar to that specified, with five years minimum experience.
- B. Installer: Stonework shall be performed by a firm with a minimum of three years of successful experience in the type of work specified in this section.

1.04 JOB MOCK-UP

- A. Mock-Up Panel: Before work in this section is started, provide exterior mock-up for Owner and Architect review and approval of all exterior finish elements materials and construction manner. Comply with provisions of Section 01-3323.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver cast stone materials to project in accordance with manufacturer's recommendations and Section 01-6000.
- B. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, breakage, chipping, or other causes.

PART 2 PRODUCTS

2.01 MANUFACTURED STONE

- A. Calcium Silicate Masonry Units: Comply with ASTM C73, Grade SW; solid units that have been pressure formed and autoclaved; 3-5/8" bed depth; special shapes as indicated on drawings:
 - 1. Manufacturer: Arriscraft Corporation
 - 2. Product: Renaissance
 - 3. Size: As indicated on Drawings.
 - 4. Color: As selected by Architect.
 - 5. Facing: Smooth
- B. Substitutions: Products by other manufacturers are acceptable if they meet the requirements of this section. See Section 01-2513 Product Substitution Procedures.

2.02 MORTAR MATERIALS

- A. Materials: Portland cement, masonry lime, and sand mortar mix; proportions 1:1:6.
- B. Grout: maximum 6,500 psi at 28 days.
- C. Water: Clean, non-alkaline and potable.

2.03 STONE ANCHORS AND ATTACHMENTS

- A. General: Provide anchors and attachments of type and size recommended by manufacturer and as required to support stonework.
- B. Anchors, Bolts, Nuts, Washers, Dowels: Hot-dipped galvanized after fabrication.
- C. Steel angles supporting units; ASTM A36 for materials and ASTM A123 for galvanizing.

2.04 STONE ACCESSORIES

- A. Setting Buttons: Lead or plastic buttons, non-staining to stone, sized to suit joint thicknesses and bed depths of stonework without intruding into required depths of joint sealants or causing third-side adhesion between sealant and setting button.
- B. Concealed Sheet Metal Flashing: Specified in Section 07-6200, in thicknesses indicated.
- C. Weeps and Vents: Molded PVC grilles, insect resistant.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com.
 - b. Masonry Reinforcing Corp. of America (Wire-Bond): www.wirebond.com.
 - c. Heckmann Building Products Inc: www.heckmannbuildingprods.com.
 - d. Substitutions: See Section 01-2513 Product Substitution Procedures.
 - 2. Color: To be selected by architect from manufacturer's standard options
- D. Sealant: Type specified in Section 07-9005, complete with backer rod, and compatible with joint fillers, joint substrates and related materials.

MANUFACTURED MASONRY (CALCIUM SILICATE) 04-7313 - 3
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- E. Cleaning Solution: Of type which will not harm stones, joint materials, or adjacent surfaces. Consult stone supplier for recommended type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Installer shall verify that building structure and site conditions are ready to receive stonework and shall report in writing any conditions which are not in compliance with requirements.
- B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean stone surfaces which have become dirty or stained prior to setting by thoroughly scrubbing with fiber brushes followed by a thorough drenching with clear water.

3.03 SETTING STONE, GENERAL

- A. Installers: Use skilled brick masons at the site to do necessary field cutting as stones are set.
 - 1. Use power saws to cut stones; for exposed edges, produce edges which are cut straight and true.

3.04 ADJUSTING AND CLEANING

- A. Remove and replace stonework which is broken, chipped, and stained and with defective joints and stones and joints not matching approved samples and field-constructed mock-ups.
- B. Replace in manner which results in stonework showing no evidence of replacement.
- C. Clean stonework not less than 6 days after completion of work, using clean water and stiff bristle fiber brushes. Wire brushes, acid type cleaning agents, cleaning compounds with caustic or harsh fillers is not acceptable.

3.05 PROTECTION

- A. Protect and maintain conditions, in a manner acceptable to fabricator and installer.

END OF SECTION

SECTION 05-5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Miscellaneous shop fabricated metal steel items. as required to complete the work of this project.
- B. Downspout boots.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Shop Drawings: Clearly indicate:
 - a. Fabrication and erection requirements for miscellaneous metal fabrications required to complete the work of this project.
 - b. Profiles, sizes, spacings and locations of structural members, type of connections.
 - c. Welded connections using standard AWS welding symbols including net weld lengths.
 - d. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis.
 - e. Reproduction of structural drawings for shop drawings is not acceptable. Submittal will be returned unreviewed.

1.03 QUALITY ASSURANCE

- A. Shop Assembly: Items shall be assembled in the shop to the extent possible to minimize field-splicing and assembly.
 - 1. Items shall be disassembled only as necessary for shipping and handling.
 - 2. Items shall be marked for re-assembly and coordinated installation.

1.04 DELIVERY AND STORAGE

- A. Miscellaneous metal fabrications shall be delivered to and stored at the job-site in accordance with Sections 01-6000.
- B. Store materials under roof or cover prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Plates, Shapes and Bars: ASTM A36/A36M.
- B. Gray Iron Castings: ASTM A48, Class 30.
- C. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
- D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fabricate structural steel items in accordance with approved shop drawings, recommendations of American Institute of Steel Construction (AISC) and applicable accessibility code.
 - 1. For structural steel work, comply with Structural Engineer's design requirements.
- B. Verify dimensions on site prior to shop fabrication.
- C. Fit and shop assemble items in largest practical sections, for delivery to site.
- D. Weld or rivet all permanent connections.
- E. Fabricate items with joints tightly fitted and secured.
- F. Form joints exposed to weather to exclude water.
- G. Provide holes and connections for work of other trades.
- H. 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.
- I. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- J. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- K. Castings shall be uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion or other defects.

2.03 FABRICATED ITEMS

- A. Provide and install miscellaneous framing, supports, trim and other shop-fabricated items as required to complete the work, including items shown on drawings and listed in the following schedule.
 - 1. The Schedule is a list of principal items only. Refer to Drawings for items not specifically scheduled.
- B. For Masonry Work: Structural steel lintels for openings and recesses in masonry walls and partitions as indicated; galvanized finish.

2.04 DOWNSPOUT BOOTS

- A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
 - 1. Configuration: Angular.

2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
3. Finish: Manufacturer's standard factory applied powder coat finish.
4. Color: To be selected by Architect from manufacturer's standard range.
5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, rubber coupling, and custom extension to 10 feet.
6. Manufacturers:
 - a. Downspoutboots.com, a division of J. R. Hoe & Sons:
www.downspoutboots.com/#sle.
 - b. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.05 FINISHES - STEEL

- A. Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat. Primer to comply with quality requirements of Structural Steel Painting Council (SSPC).
- E. All exterior steel loose lintels exposed to view and/or the weather shall be galvanized.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Obtain Architect's approval prior to site cutting or making adjustments not scheduled.
- B. Clean and strip primed steel items to bare metal where site welding is required.
- C. Coordinate the work of this Section with the appropriate trades.
 1. Supply the appropriate items to the trades.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

METAL FABRICATIONS 05-5000 - 4

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G. After installation, touch-up field welds, scratched or damaged surfaces with primer.

END OF SECTION

SECTION 05-5133.10
PREFABRICATED METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prefabricated ship ladders.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Shop Drawings:
 - a. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.03 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B211/B211M, 6005 alloy, T5 temper.
- B. Bolts, Nuts, and Washers: Stainless steel.
- C. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. 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.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 PREFABRICATED LADDERS

- A. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3 and OSHA 1910.25; factory fabricated to greatest degree practical and in the largest components possible.

PREFABRICATED METAL LADDERS 05-5133.10 - 2
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1. Components: Manufacturer's standard rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
2. Materials: Aluminum; ASTM B211/B211M 6063 alloy, T52 temper.
3. Incline: 45 degrees.
4. Finish: Powder coat; color to be selected by Architect from manufacturer's full range.
5. Height/ Length: As required for application.
6. Width: 48 inch, minimum.
7. Capacity: Unit shall support a 1000 lbs loading without failure.
8. Accessories: Provide the following optional components:
 - a. Handrail at stair.
 - b. Guardrail at platform.
9. Manufacturers:
 - a. Precision Ladders, LLC; Model PS: www.precisionladders.com/#sle.
 - b. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.04 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Superior performance organic coating.
- B. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; color as selected from manufacturer's standard colors.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 06-1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Nonstructural dimension lumber framing.
- C. Rough opening framing for doors, windows, and roof openings as required in impact rating approvals.
- D. Sheathing.
- E. Miscellaneous rough carpentry as required to complete the work of this project.
- F. Blocking and nailers for roof system and flashings.
- G. Preservative treated wood materials.
- H. Fire retardant treated wood materials.
- I. Communications and electrical room mounting boards.
- J. Concealed wood blocking, nailers, and supports.
- K. Miscellaneous wood nailers, furring, and grounds.

1.02 QUALITY ASSURANCE

- A. Rough carpentry lumber shall bear visible grade stamps of agency certified by National Forest Products Association (NFPA).
- B. Preservative Treatment by Pressure Process: ACQ Preserve lumber and plywood requirements for preservative treatment. Treatment plant shall be licensed by manufacturer of treated material.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction.
- D. Sheathing Manufacturer: Firm with minimum five years experience in successfully producing gypsum sheathing similar to that indicated for this project.

1.03 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Clearly indicating compliance with requirements of Section for construction panels.
 - 2. Certification of Treating Plant:
 - a. Wood Preservatives: Submit certificate stating water-borne chemical and process used, net amount of preservative retained, and compliance with applicable standards. Include statement that moisture content of treated lumber was reduced to a maximum of 19% and plywood to 15% prior to shipment to site.

- b. Water-Borne Treatment: Statement that moisture content of treated materials was reduced to levels indicated in this Section, prior to shipment to project site.

1.04 JOB MOCK-UP

- A. Mock-Up Panel: Before work in this section is started, provide exterior mock-up for Owner and Architect review and approval of all exterior finish elements materials and construction manner. Comply with provisions of Section 01-3323.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.
- C. Products shall be delivered, stored and protected at job-site in accordance with manufacturer's recommendations bearing manufacturer's labels in accordance with Section 01-6000.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Southern Pine, unless otherwise indicated.
 - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 by 2 through 2 by 6):

1. Grade: No. 2.
- E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
 1. Species: Southern Pine.
 2. Grade: No. 2.
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: No. 2 or Standard Grade.

2.03 CONSTRUCTION PANELS

- A. Roof Sheathing: APA rated Structural I Sheathing.
 1. Bond Classification: Exposure 1.
 2. Span Rating: 24.
 3. Performance Category: 5/8 PERF CAT.
- B. Wall Sheathing, For Exterior walls and Parapets: PS 2 type.
 1. Bond Classification: Exterior.
 2. Grade: Structural I Sheathing.
 3. Span Rating: 16.
 4. Edge Profile: Square edge.
- C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Blocking and Plywood Fasteners and Anchors:
 1. Metal and Finish: Stainless steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Sheathing Fasteners:
 1. Nails: For fastening into wood use fasteners as required by the applicable Building Code for compliance on embedment and structural rating. Galvanized fasteners must be used at all treated wood connections.
- C. Metal Framing Anchors: Made from hot dipped, zinc-coated steel sheet complying with ASTM A653/A653M, G60 designation.
 1. Manufacturer: Simpson Strong-Tie Company, Inc.
 2. Substitutions: See Section 01-2513 Product Substitution Procedures.
 3. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
 4. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

- D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- E. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.
 - 1. Thickness: 68 mil, 0.068 inch.
 - 2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
- F. Air and Water Barrier: As specified in Section 07-2726.
- G. Sealant, Tape and Joint Filler for Sheathing: As recommended by sheathing manufacturer as being compatible with specified gypsum sheathing board

2.05 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 exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- C. 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. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. 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.
- G. 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.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.05 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at each roof opening except where specifically indicated otherwise; form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. At long edges use sheathing clips where joints occur between roof framing members.
 - 2. Nail panels 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 nails.
 - 1. Locate edge joints parallel to and located on framing.
 - 2. Stagger intermediate end joints of adjacent lengths of sheathing.
 - 3. Drive fasteners to bear tight against surface of sheathing. Do not countersink.
 - 4. Locate fasteners 3/8" minimum from edges and ends of sheathing panels.
 - 5. See structural drawings for shearwall requirements.
- C. Sealant and Joint Filler Applications at Walls:
 - 1. Apply compatible joint sealant recommended by sheathing manufacturer and tape to all joints in sheathing and at perimeters interfacing with other materials.
- D. Install flashing as indicated on drawings and specified in Section 07-6200.
- E. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches 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.
 - 4. Size and Location: As indicated on drawings and required for shown equipment.

3.07 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.

3.08 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements for additional requirements.

END OF SECTION

SECTION 06-1760

METAL-PLATE-CONNECTED WOOD TRUSSES

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 wood roof, floor and girder trusses and truss accessories.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for roof sheathing and subflooring and dimension lumber for supplementary framing and permanent bracing.
 - 2. Division 6 Section "Miscellaneous Carpentry" for roof sheathing and subflooring and dimension lumber for supplementary framing and permanent bracing.

1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.
- 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. SPIB - Southern Pine Inspection Bureau.
 - 4. WCLIB - West Coast Lumber Inspection Bureau.
 - 5. WWPA - Western Wood Products Association.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
 - 2. Maximum Deflection Under Design Loads:
 - a. Roof Trusses: 1/240 of span.
 - b. Floor Trusses: Vertical deflection of 1/360 of span.

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1.5 SUBMITTALS

- A. Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice details; type, size, material, finish, design values, orientation, and location of metal connector plates required temporary and permanent truss member braces and bearing details.
 - 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.
- B. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.
- C. Qualification Data: For metal-plate manufacturer, professional engineer, fabricator and Installer.
- D. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.
 - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer registered in the state that the project is constructed.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that involves inspection by SPIB, Timber Products Inspection, TPI, or other independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
- C. Source Limitations for Connector Plates: Obtain metal connector plates through one source from a single manufacturer.
- D. Comply with applicable requirements and recommendations of the following publications:
 - 1. TP1 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
 - 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
 - 3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
- E. Wood Structural Design Standard: Comply with applicable requirements in AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

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1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with TPI recommendations to avoid damage and lateral bending. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

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. Metal Connector Plates:
 - a. Alpine Engineered Products, Inc.
 - b. Mitek Industries, Inc.
 - 2. Metal Framing Anchors: Simpson Strong-Tie Company, Inc. No substitutes will be accepted.

2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive natural or stained finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified.
 - 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement."
- C. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded as follows and of the following minimum design values for size of member required according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement":

METAL-PLATE-CONNECTED WOOD TRUSSES 06-1760-4
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1. Grading Method: Visual or mechanical.

2.3 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1 from metal complying with requirements indicated below:
- B. Hot-Dip Galvanized Steel Sheet: ASTM A 653, G60 coating designation; Designation SS, Grade 33, and not less than 0.036 inch thick.
- C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, 80Z coating designation; ASTM A 570, Structural Steel (SS), Grade 33, and not less than 0.047 inch thick.
- D. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, AZ50 coating designation; Structural Steel (SS), Grade 33, and not less than 0.036 inch thick.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, and not less than 0.035 inch thick.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 1. Where trusses are exposed to weather or in ground contact, of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.

2.5 METAL FRAMING ANCHORS

- A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
 1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
 2. Allowable Design Loads: Provide products with allowable design loads, 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.

METAL-PLATE-CONNECTED WOOD TRUSSES 06-1760-5
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- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/, G60 coating designation.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304.
 - 1. Use for exterior locations and where indicated.
- D. Truss Tie-Downs (Hurricane or Seismic Ties): Simpson ties or anchors for fastening roof trusses supporting members as required by design.
- E. Floor Truss Hangers: Simpson hangers, full depth of floor truss, as required by design.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
 - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. Before installing, splice trusses delivered to Project site in more than one piece.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

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- G. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
 - 1. Anchor trusses to girder trusses as indicated.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install and fasten strong-back bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not cut or remove truss members.
- L. Replace wood trusses that are damaged or do not meet requirements.
 - 1. Do not alter trusses in field.

3.2 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
 - 1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION

SECTION 06-4100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated laminate-clad cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Factory finishing.
- E. Homogeneous solid surface material for window stools and countertops.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Shop Drawings: Shall be of sufficient scale and detail to determine compliance with the AWI requirements and these specifications, including the following:
 - a. Elevations and plan views of the required work, fully dimensioned.
 - b. All cabinet hardware & miscellaneous items required to complete this work.
 - c. Type and quality of finishes.
 - 2. Samples of the following:
 - a. Plastic laminate for texture and color selections.
 - b. Cabinet hardware (1 of each type).
 - c. Homogeneous hard surface material (6" x 6").
 - 3. Manufacturer's product data describing type and quality of the following:
 - a. Plastic laminate (face grade and liner grade).
 - b. Cabinet hardware (each type).
 - c. Homogeneous solid surface material.

1.03 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of experience on similar projects, with sufficient production capacity to produce required units without causing delay in the Work.
- B. AWI Quality Standard: Company with "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute (AWI) which are by reference made a part of this specification.
 - 1. Any reference to Custom Grade in this specification shall be as defined in the AWI publication "Architectural Woodwork Quality Standards", latest edition.
 - 2. Any item not given a specific quality grade shall be Custom Grade as defined in AWI publication, latest edition.
- C. All homogeneous solid surface work shall be performed by a Manufacturer Certified fabricator.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, spoilage, and deterioration.
- B. Protect units from moisture damage.

1.05 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop drawings.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Grade: Custom Grade in accordance with AWI/AWMAC/WI (AWS) Section 400 and Division 400B "Laminate Clad Cabinets".
- B. Plastic Laminate Faced Cabinets: Custom grade.
- C. Cabinets:
 - 1. Finish - Exposed Exterior Surfaces: Decorative laminate.
 - 2. Finish - Exposed Interior Surfaces: Decorative laminate.
 - 3. Finish - Semi-Exposed Surfaces: Decorative laminate.
 - 4. Finish - Concealed Surfaces: Thermoset Decorative Overlay.
 - 5. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
 - 6. Door and Drawer Front Retention Profiles: Fixed panel.
 - 7. Casework Construction Type: Type A - Frameless.
 - 8. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
 - 9. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
 - a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
 - 10. Adjustable Shelf Loading: 40 psf.
 - a. Deflection: L/144.
 - 11. Drawer Side Construction: Multiple-dovetailed.

2.02 WOOD-BASED COMPONENTS

- A. Softwood Lumber: PS20; graded in accordance with AWI; size and profiles as shown on drawings; maximum moisture content of 6 percent; species Contractor's option.
 - 1. Use: Cabinet frame and concealed components.
- B. Softwood Plywood: Doc PSI:

1. Type: Veneer core, type 1 glue, no voids, B-B face veneer, species Contractor's option.
 2. Use: Sub-tops, countertops and concealed conditions.
- C. Marine Plywood:
1. Type: Veneer core, type 1 glue, no voids, B-B face veneer, species Contractor's option.
 2. Use: Sub-tops at sink locations.
- D. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- B. Provide specific types as indicated.
1. Horizontal Surfaces: HGS, 0.050 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
 2. Vertical Surfaces: VGS, 0.032 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
 3. Concealed Surfaces: Thermoset Decorative Overlay - Particleboard complying with ANSI A208.1, Grade M 2, or medium density fiberboard complying with ANSI A208.2, Grade MD with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT 1.

2.04 COUNTERTOPS

- A. General: Provide 2" radius for front corners of countertops.
- B. Plastic Laminate Countertops: Plywood substrate covered with HPDL, conventionally fabricated, with decorative plastic edge.
- C. Solid Surface Countertops: Homogeneous solid sheet material of filled plastic resin complying with materials and performance requirements in ANSI Z124.3 for type 5 or type 6, without a precoated finish.
1. Manufacturer/ Color/Pattern: As indicated on Finish Drawings.
 2. Thickness: As detailed.
 3. Joint Adhesive: As made especially for joining solid material surfaces, in appropriate color.
 4. Caulk: Silicone sealant, in colors as furnished by manufacturer

2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Caulk: As specified in Section 07-9005.
- C. Plastic Edge Banding: 0.039 inch Extruded PVC, flat shaped; smooth finish; of width to match component thickness.
1. Color: Match color and grain of laminate.
 2. Use at edges of doors drawers and countertops.

- D. Aluminum Corner Guards: 90 degree outside corner etched satin anodized aluminum extrusion with fins for support.
 - 1. Fry Reglet Architectural Metals; Millwork Corner Key: www.fryreglet.com.
 - 2. Futura Industries; 60080: www.futuraind.com.
- E. Glass: Type S1, see Section 08-8000.
- F. Sealants, Gaskets, Tapes: As recommended by manufacturer
- G. Fasteners: Size and type to suit application.
- H. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; chrome-plated finish in concealed locations and chrome-plated finish in exposed locations.
- I. Concealed Joint Fasteners: Threaded steel.

2.06 HARDWARE

- A. General: Provide cabinet hardware and accessory materials for cabinets as indicated. Hardware items not shown but required for function indicated shall be furnished in the same finish and quality. Hardware shall comply with ADA, BHMA A156.9.
- B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated adjustable pycarbonate self rests, interior cabinet matching finish, for nominal 1 inch spacing adjustments.
- C. Fixed Standard Shelf, Countertop, and Workstation Brackets:
 - 1. Material: Steel.
 - 2. Finish: Manufacturer's standard, factory-applied primer.
 - 3. Height on wall: 18 inch.
 - 4. Types:
 - a. Quarter round counters: 12 inch deep, in-wall.
 - b. 24 inch deep counters: 18 inch deep.
 - c. Counters deeper than 24 inch: 24 inch deep.
 - d. In wall: Model Inside wall - Flush Mount.
 - 5. Products:
 - a. Rakks/Rangine Corporation; EH Series Brackets and In-wall Flush: www.rakks.com/#sle
 - b. A&M Hardware, Inc; Standard Brackets and Concealed Brackets: <http://www.aandmhardware.com/#sle>.
- D. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.
 - 1. Product: 116.07.438 manufactured by Hafele.
- E. Cabinet Keycode Locks: Keyless lock; battery operated, using 4 to 8 digit code and lever, self locking, satin silver finish.
 - 1. Product: Regulator manufactured by CompX Security Products.
- F. Drawer Slides: BHMA No: BO4013.
 - 1. Type: Full extension, self close.
 - 2. Static Load Capacity: 100 lbs, minimum.

3. Mounting: Side mounted.
4. Product: KV8450 manufactured by Knape & Vogt.
- G. Door Hinges: Concealed (fully mortised) self-closing type, BHMA No. BO1612 & 3, steel with satin finish.
 1. Product: 71M2550 manufactured by Blum, Inc.
- H. Continuous Hinges: Continuous aluminum hinges;
 1. Product: SC311 manufactured by Stanley.
- I. Grommet: Molded plastic and matching plastic caps with slot for wire passage.
 1. Model: Series SG
 2. Size: 2 inch
 3. Manufacturer: Doug Mockett and Company, Inc.
 4. Locate where indicated on Drawings and/or as required.
- J. Rails for Hanging Files: Provide body mounted molded rails for legal or letter size as indicated by manufacturer's model number. Cutting or machining of drawer body/face not allowed.
- K. Aluminum U-channel Glass Supports: Aluminum finish U-Channel with top load roll-in glazing gasket and bottom support.
 1. Finish: Satin anodized.
 2. Product for Top: UC3812SL as manufactured by C.R. Laurence Company, Inc: www.crlaurence.com
 3. Product for Bottom: SC3812SL as manufactured by C.R. Laurence Company, Inc: www.crlaurence.com
- L. Provide additional hardware as required to complete details shown on drawings. Submit product data on additional hardware proposed for review during submittals.
- M. Substitutions: Products of other manufacturers may be submitted for review in accordance with Section 01-2513 Product Substitution Procedures.

2.07 WINDOW STOOLS

- A. General: Homogeneous solid sheet window stools cut to width required.
 1. Color/Pattern: As indicated on Finish Schedule
 2. Thickness: 1/2 inch
 3. Edges: Top edge 1/8" radius.
 4. Joint Adhesive: Especially manufactured for joining sheets, in color to match adjoining material.
 5. Caulk: Silicone sealant, in colors as manufactured for use with solid surface material.

2.08 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

- C. Before fabricating woodwork, field verify critical dimensions.
- D. Complete fabrication, including assembly, finishing, and hardware application to maximum extent possible, before shipment to project site. Disassembly components only as necessary for shipment and installation.
- E. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- F. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum 2 feet from sink cut-outs.
- G. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Sand edges of cutouts to remove splinters and burrs. Seal cut edges with a water resistant sealer.

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.
- C. Condition architectural woodwork to average prevailing humidity conditions before installing.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure custom cabinets and countertops 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 and countertops.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. 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.
- H. Countertops:
 - 1. Install countertops at heights to comply with applicable Accessibility Code requirements.
 - 2. Install countertops level and secure.
 - 3. Make joints flush and hairline.
 - 4. For countertops over knee spaces exceeding 36 inches in width, install specified metal brackets.

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5. Attach countertops to wood blocking and steel counter brackets, from underside with screws. All fasteners shall be concealed.
- I. Homogeneous solid surface material to be secured in accordance with manufacturer's instructions.
 1. Joints shall be formed using manufacturer's tinted adhesive to achieve a smooth inconspicuous joint.
 2. Joints at dissimilar materials shall be caulked with silicone sealant.
- J. Chipped, scratched or patched plastic laminate will not be accepted and must be replaced.
- K. Sealant: As specified in Section 07-9005 for following locations and colors indicated:
 1. At backsplash and wall. Color to match backsplash.
 2. Between backsplash and countertop. Color to match countertop.
 3. Around fixtures recessed into countertop. Color to match countertop.
 4. Base cabinets to wall. Color to match cabinet.
 5. Wall cabinets to wall. Color to match cabinet.
 6. In toe spaces where base of cabinet intersects with base. Color to match cabinet.
 7. Countertops to base cabinets. Color to match cabinet.
 8. Elsewhere as indicated on drawings and as required to close gaps.

3.03 ADJUSTING

- A. Repair damaged and defective millwork to eliminate defects functionally and visually; where not possible to repair, replace millwork. Adjust joinery for uniform appearance.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING AND PROTECTION

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.
- B. Protect cabinets and other woodwork items during remainder of construction period, in a manner acceptable to manufacturer and Installer.

END OF SECTION

SECTION 07-2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at cavity wall construction and perimeter foundation wall.
 - 1. Insulation board for roofing work is specified in roofing Section /Division 7 and is not part of this Section.
- B. Batt insulation in exterior wall construction.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Indicating full compliance with requirements of this Section; clearly describing insulation performance and installation recommendations.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Manufacturer's Warranty: As specified elsewhere within this section.

1.03 WARRANTY

- A. Provide manufacturer's standard warranties to be free from defects in material and/or workmanship that materially affect its performance and will maintain at least 90% of advertised R-value for the periods noted below from Substantial Completion.
 - 1. Batt/ Blanket Insulation: None
 - 2. Rigid Board Insulation: Lifetime

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.
- B. Insulation in Wood Framed Walls: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces and FM approved, Class 1.
 - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature minimum.
 - 5. Board Edges: Square.
 - 6. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.

7. Permeability, maximum: 1.0 when tested in accordance with ASTM E96.
8. Product: Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
9. Alternate Manufacturers: Products of the following manufacturers and other manufacturers are acceptable subject to meeting the requirements of this Section.
 - a. Dow Chemical Company: www.dow.com/sle.
 - b. Diversifoam: www.diversifoam.com
 - c. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.03 BATT INSULATION MATERIALS

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
 4. Formaldehyde Content: Zero.
 5. Thermal Resistance: R of 19.
 6. Thickness: 6.25 inch.
 7. Facing: Unfaced.
 8. Product: Thermal Batt Fiberglas as manufactured by Owens Corning Corporation, www.owenscorning.com.
 9. Alternate Manufacturers: Products of the following manufacturers and other manufacturers are acceptable subject to meeting the requirements of this Section.
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Georgia-Pacific Corporation: www.gp.com.
 - c. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.04 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.

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 irregularities or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Install boards horizontally on foundation perimeter.
 1. Place boards to maximize adhesive contact.

2. Install in running bond pattern.
 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Install board insulation on concrete, concrete masonry unit substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to concrete and CMU substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

3.03 BOARD INSTALLATION AT CAVITY WALLS

- A. Secure impale fasteners to substrate at following frequency:
1. 4 per 10 sq ft.
- B. Install boards to fit snugly between wall ties.
- C. Install boards horizontally on walls.
1. Install in running bond pattern.
 2. Butt edges and ends tightly to adjacent boards and protrusions.
 3. Place impale fastener locking discs.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
1. Seal around cut-outs with approved adhesive.
- E. Cover fasteners with air and water barrier or provide fasteners that seal to air and water barrier.

3.04 BATT INSTALLATION

- A. Install insulation 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. Retain insulation batts in place with wire mesh secured to framing members.
- F. Coordinate work of this section with construction of air barrier seal specified in Section 07-2726.

3.05 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07-2610
UNDER-SLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vapor barrier and installation accessories for installation under concrete slabs.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Product Data including proposed product (manufacturer and product), manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
 - 2. Report: Manufacturer final installation inspection reports to Architect, Owner and Contractor.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals.
 - 1. Warranty: Written warranty and supporting letter as specified elsewhere within this section.

1.03 WARRANTY

- A. See Section 01-7800 - Closeout Submittals for additional warranty requirements.
 - 1. Life of the Building Warranty: Manufacturer's standard form indicating compliance with meets all of the requirements for its designated ASTM E1745 classification.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Vapor barrier shall have all of the following qualities:
 - 1. Maintain permeance of less than 0.01 Perms as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
 - 2. Other performance criteria:
 - a. Strength: ASTM E1745 Class A.
 - b. Thickness: 20 mils minimum
 - 3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.
- B. Vapor barrier products:
 - 1. Basis of Design: Stego Wrap 20-Mil Vapor Barrier System; Stego Industries LLC.; www.stegoindustries.com.

2.02 ACCESSORIES

- A. Products as recommended by the manufacturer for a complete system including the following:
 - 1. Seam Tape and Penetration Repair: Stego Tap, Stego Mastic.
 - 2. Perimeter/edge seal, as applicable: Stego Crete Claw, Stego Term Bar, StegoTack Tape (double-sided sealant tape)

3. Penetration Prevention: Beast Foot, Beast Form
4. Vapor Barrier-Safe Screed System: Beast Screed, Beast Hook

PART 3 – EXECUTION

3.01 PREPARATION

- A. Ensure that subsoil has been tested and complies with geotechnical engineer recommendations.
- B. Level and compact base material.

3.02 INSTALLATION

- A. Install vapor barrier in accordance ASTM E1643 and manufacturer's installation instructions.
 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
 - a. Seal vapor barrier to the entire slab perimeter.
 - b. Seal vapor barrier to the entire perimeter wall or footing/grade per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
 3. Overlap joints 6 inches and seal with manufacturer's seam tape.
 4. Apply seam tape to a clean and dry vapor barrier.
 5. Seal all penetrations, including pipes per manufacturer's instructions.
 6. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use penetration prevention accessories as a vapor barrier-safe forming system. Ensure prevention system base is fully adhered to the vapor barrier.
 7. If non-permanent stakes must be driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
 8. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
 9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
 10. Install vapor barrier-safe screed system per manufacturer's instructions prior to placing concrete.

END OF SECTION

SECTION 07-2726
FLUID APPLIED AIR AND WATER BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Complete water and air barrier system applied to concrete unit masonry and plywood sheathing substrates on cavity side of veneered walls to create a continuous barrier to air and act as a drainage plane to discharge incidental condensation or water penetration.
- B. Coordinate this Section with Section 07-6200.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Clearly describing the quality of all materials and recommendations for application. Include all accessories to system for application and ICC evaluation report indicating compliance with local codes for air barrier and water-resistive barrier.
 - 2. Manufacturer's Installation Instructions: Drawings and details that clearly indicate the application of the materials to meet the performance requirements.
 - 3. Test Reports: ICC evaluation report indicating compliance with local codes for air barrier and water-resistive barrier.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Warranty: Written warranty and supporting letter as specified elsewhere within this section.
 - 2. Certification by installer of dry mil thickness of installed system.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Air and water barrier system shall consist of materials and components from a manufacturer with a "single-source" responsibility and warranty and able to demonstrate at least ten years of successful experience.
 - 1. Installer: Air and water barrier work shall be performed by a firm certified in writing by the membrane system manufacturer.
 - 2. The firm shall specialize in this type of work and be able to demonstrate at least three years of successful experience in this type of work.

1.04 JOB MOCK-UP

- A. Mock-Up Panel: Before work in this section is started, provide exterior mock-up for Owner and Architect review and approval of all exterior finish elements materials and construction manner. Comply with provisions of Section 01-3323.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 DELIVERY, HANDLING, STORAGE

- A. Products shall be delivered to job-site in original unopened packages bearing manufacturer's labels.
- B. Store and protect products in accordance with manufacturer's recommendations.
 - 1. Maintain temperature and humidity within ranges required by manufacturer's instructions.

1.07 WARRANTY

- A. See Section 01-7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty that air and vapor barrier and accessories are free of defects at time of delivery and for a period of five years.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Membrane and accessories to act as a continuous assembly to meet code requirements for air barrier and water-resistive barrier.
 - 1. Assembly Air Barrier Performance: Air leakage not to exceed 0.04 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) when tested in accordance with ASTM E2357.
 - 2. Assembly Fire-Resistive Performance: Successfully tested as part of NFPA 285 compliant wall assemblies.
 - 3. Assembly Water-Resistive Performance: Exhibit no visible water leakage when tested per ASTM E 331 and shall perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration.

2.02 FLUID-APPLIED, VAPOR PERMEABLE MEMBRANE AIR BARRIER SYSTEM

- A. Fluid Applied Air Barrier Membrane: Grace Perm-A-Barrier VPL, as manufactured by Grace Construction Products: www.na.graceconstruction.com; a fluid-applied, vapor permeable, acrylic or polymer membrane that cures to form a resilient, monolithic, fully bonded elastomeric membrane when applied to construction surfaces. Product shall have the following minimum physical properties:
 - 1. Thickness: 68 mils wet, minimum of 40 mils dry
 - 2. Membrane Air Permeance: ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf)
 - 3. Membrane Vapor Permeance: ASTM E96, Method B: 15 perms
 - 4. Pull Adhesion: ASTM D4541: min. 30 psi or substrate failure to glass faced wall board, min. 100 psi to concrete/CMU
 - 5. UV Exposure Limit: Not more than 180 calendar days
- B. Transition Membrane: Perm-A-Barrier Detail Membrane as manufactured by Grace Construction Product; 40 mil thick membrane conforming with the following:
 - 1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms max.

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2. Air Permeance at 75 Pa (0.3 in. water) pressure difference: 0.00012 cfm/ sq. ft. max.
 3. Puncture Resistance: ASTM E154: 40 lbs. min.
 4. Tensile Strength: ASTM D412, Die C Modified: min. 400 psi
 5. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%
- C. Flexible Membrane Wall Flashing: Perm-A-Barrier Wall Flashing as manufactured by Grace Construction Products; 40 mil membrane conforming with the following:
1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms max.
 2. Water Absorption: ASTM D570: max. 0.1% by weight
 3. Puncture Resistance: ASTM E154: 80 lbs. min.
 4. Tear Resistance:
 - a. Initiation ASTM D1004: min. 13.0 lbs. M.D.
 - b. Propagation ASTM D1938: min. 9.0 lbs. M.D.
 - c. Tensile Strength: ASTM D412, Die C Modified: min. 800 psi
 - d. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%
- D. Substitutions: The systems associated with the membrane products by the following manufacturers are acceptable if they meet the requirements of this section.
1. Sto Corp; StoGuard AirSeal: www.stocorp.com
 2. Carlisle Coatings and Waterproofing; Carlisle's BarriTech VP: www.carlisle-ccw.com
 3. Prosoco, Inc; R-Guard Cat 5 Rain Screen: www.prosoco.com.
 4. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.03 ACCESSORIES

- A. Primers: Primers for membranes and flashing as recommended by membrane manufacturer
- B. Termination bars: Termination bars of material recommended by the manufacturer to secure the flexible flashing to the substrate.
- C. Liquid membrane sealant for penetrations and terminations as recommended by manufacturer
- D. Joint Sealant: As recommended by air barrier system manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates and conditions are ready to accept the Work of this section. Notify contractor in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.

- B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

3.02 PREPARATION

- A. Protect adjacent Work areas and finish surfaces from damage during membrane applications.
- B. Surface should be free of oil, grease, dirt, laitance, and loose material.
- C. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Completely fill the sheathing joint with air barrier system manufacturer's recommended sealant and then install a scratch coat, approximately 15-30 mils of air barrier system manufacturer's recommended sealant with a margin trowel or similar onto the face of the sheathing approximately 1 inch on each side of the sheathing joint, ensuring the edges are tapered to prevent shadowing of the spray application.
- D. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

3.03 APPLICATIONS

- A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
- C. Apply a continuous unbroken air barrier to substrates according to the minimum thickness noted above.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.
- E. Seal around all items projecting through walls including masonry ties with approved sealing mastic.
- F. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- G. At end of each working day, seal top edge of strips and transition membrane to substrate with termination sealant.

3.04 FLASHING INSTALLATION:

- A. Priming: Where priming is recommended by flashing manufacturer, clean surfaces to remove residual dust before priming. Stir primer. Apply at rate recommended by manufacturer. Allow primer to dry before application of flashing.
- B. Vertical Surfaces: Install sheet membrane in horizontal fashion with shingle style overlapping seams. Overlap edge seams 2.5 inches, end laps 5 inches. Stagger end seams. Roll in place with a 24 inch minimum wide roller or broom. Ensure that all laps are firmly adhered and that there are no gaps or fishmouths.
- C. Provide flashing 24 inch in both directions from corners.
- D. Terminations: Apply fasteners on 6 inch centers along the top edge of the application to assist in initial adhesion. Roll terminating edges, and seams firmly. Apply sealants or mastic to all terminations and "T" – joints. Provide termination bars where indicated on drawings.
- E. Trim bottom edge 0.5 inch back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
- F. At heads, sills and flashing terminations turn up ends a minimum 4 inches above metal flashing or onto wall, to the surface of the veneer and make careful folds to form an end dam, with the seams sealed.
- G. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.

3.05 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
- B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace main air barrier material exposed for more than recommended exposure.
- C. Do not expose flashing membrane to sunlight for more than thirty days prior to enclosure.
- D. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- E. Remove masking materials after installation.

END OF SECTION

SECTION 07-5400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Vapor retarder/ thermal barrier.
- D. Flashings.
- E. Roofing stack boots and walkway pads.
- F. Coordinate work of this Section with Section 07-6200 for shop fabricated accessories.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Product Data: Include data substantiating that materials comply with requirements of this Section.
 - 2. Shop Drawings: Showing roof configuration, including layout of tapered insulation material, sheet layout, seam locations, colors (as applicable), details at perimeter, and special conditions such as gravel guards and copings.
 - a. Provide layouts at 1/4-inch scale and details at 3-inch scale.
 - 3. Qualification Letter: Clearly containing applicator's qualification and roofing manufacturer's approval as required under Quality Assurance in this Section.
 - 4. Certification Letter: Letter from manufacturer certifying in writing that roofing materials and installation methods comply with latest VOC regulations as required under Quality Assurance in this Section.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals.
 - 1. Warranty: Written warranty and supporting letter as specified elsewhere within this section.
 - 2. Reports: Manufacturer final roof inspection reports to Architect, Owner and Roofing Contractor.

1.03 QUALITY ASSURANCE

- A. Materials furnished and installed under this Section, including membrane, fasteners, adhesives, and other roof related components, shall be manufactured or approved in writing by a firm specializing in adhered membrane roofing and able to demonstrate a minimum of ten years successful experience and with a "Single-Source" responsibility and warranty.
 - 1. Roofing products and installation methods: Comply with current federal, state, and regional VOC regulations.
 - a. Provide prefabricated (instead of shop fabricated) metal edge products as required by roofing membrane manufacturer to achieve warranty.

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- 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 this section with at least five years of documented experience and approved by manufacturer.
- D. Do not deviate from this specification and the approved shop drawings without prior written approval of the Architect and Roofing Manufacturer.
- E. Inspection Upon Completion of Installation: To be conducted by an authorized Technical Representative of Roofing Manufacturer to verify that the roofing system has been installed in accordance with Roofing Manufacturer's most current published specifications and details, and approved shop drawings.
- F. Comply with applicable seismic and wind load requirements for attachment to substrate and wind speed for warranty specified.
- G. The specified roofing assembly must have been successfully tested by a qualified testing agency to resist the design uplift pressures calculated according to ANSI/SPRI WD-1 "Wind Design Standard Practice for Roofing Assemblies"

1.04 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.
- E. Store and protect sheet metal products in accordance with Section 01-6000.
 - 1. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and provide ventilation.
 - 2. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.06 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is not within range recommended by the manufacturer.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

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- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.
- F. Phasing: Phasing is not allowed. Complete all items required to make the project watertight each day or before the start of inclement weather. Do not proceed with installation of roof or deck insulation unless the materials, equipment and tradesmen required for the installation of the roofing are at the project site. Schedule membrane work immediately (same day) behind the insulation work. Do not install more insulation each day than can be covered with membrane before the end of that working day and before the start of inclement weather.
- G. Work Organization:
 - 1. Plan and schedule progression of the work so that finished areas do not have to be walked over or otherwise used as routes for material transportation. Provide adequate protection for the new membrane on all such routes.
 - 2. Plan and administer all work by other trades associated with the roof. If trades cannot be scheduled to prevent their working over the completed roof an alternative (i.e. a temporary roof) must be approved and executed.
 - 3. When staging for or performing any new or existing roofing work, handle, store, and place adhesives, solvents and other hazardous fume materials so as to avoid any interaction with HVAC systems air intakes.
 - 4. Throughout the duration of the project the, coordinate all roofing work with the Director of Facilities prior to starting and if necessary to schedule temporary closing of HVAC intake(s) to avoid hazardous fumes from infiltrating the building.
- H. Use precautions recommended by roofing system manufacturer to avoid excessive adhesive overspray.

1.07 WARRANTY

- A. See Section 01-7800 - Closeout Submittals for additional warranty requirements.
- B. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes membrane roofing, base flashings, and all other components of membrane roofing system.
 - 2. Type / Warranty Period: Total System Warranty / 20 years from date of Substantial Completion.
 - 3. Maximum Wind Speed Coverage: Peak gusts of 80 mph measured at 10 meters above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.
- C. Repairs and replacements required because of acts of God and other events beyond Contractor/Installer/Manufacturer's control (and which exceeds performance requirements): Complete under the directions of the manufacturer and charge Owner for work at prevailing wages.

- D. Roofing Manufacturer's Warranty Letter: Furnish to the Architect, Contractor, and Owner, a letter that states:
1. All contract documents relating to the roof system have been reviewed.
 2. All materials are physically and chemically compatible with each other, and the system, as designed, is suitable for the specified warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
1. Carlisle Roofing Systems, Inc; FleeceBACK Fully Adhered TPO: www.carlisle-syntec.com/#sle.
 2. Substitutions: See Section 01-2513 Product Substitution Procedures.
- B. Insulation:
1. Provided or approved by Membrane manufacturer.

2.02 ROOFING

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.
 - a. Calculate SRI in accordance with ASTM E1980.
 - b. Field applied coating may not be used to achieve specified SRI.
 2. Thermal Emittance: 0.95, minimum, calculated in accordance with ASTM E408.
 3. Insulation Thermal Resistance (R-Value): 5.7 per inch, minimum; provide insulation of thickness required.
- C. Acceptable Insulation Types - Constant Thickness Application:
1. Minimum 2 layers of polyisocyanurate board.
- D. Acceptable Insulation Types - Tapered Application:
1. Tapered polyisocyanurate board.
- E. Edge Metal and Coping: Designed to meet ANSI/SPRI ES-1 and copatable with roof warranty specified.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
 - a. Thickness: 60 mil, 0.060 inch, minimum.
 2. Sheet Width: Factory fabricated into widest possible sheets.
 3. Color: Gray.
 4. Tear Strength: 55 lbf, measured in accordance with ASTM D751.
 5. Ozone Resistance: No cracks, ASTM D1149.
 6. Brittleness Temperature: -40 deg F., measured in accordance with ASTM D2137.

7. Water Absorption: Complies with ASTM D471.
 8. Resistance to Outdoor (UV) Weathering: No cracks, no crazing, ASTM G155.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Adhesive: FAST 100 as manufactured by Carlisle Syntec.
- D. Vapor Retarder/ Thermal Barrier: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
1. Fire-retardant adhesive.
 2. Vapor Permeability: 0.5 perm inch, measured in accordance with ASTM E96/E96M.
 3. Product: 725TR Air and Vapor Barrier manufactured by Carlisle SynTec.
- E. Primer: Low VOC contact adhesive with fast drying time.
1. Product: CavGrip manufactured by Carlisle SynTec.
- F. Flexible Flashing Material: Same material as membrane.

2.04 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
1. Classifications:
 - a. Type II:
 - 1) Class 2 - Faced with coated polymer-bonded glass fiber mat facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 3, 25 psi (172 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 2, 8.0 (1.41), minimum, at 75 degrees F.
 2. Board Size: 48 by 96 inches.
 3. Overall Board Thickness: As shown on drawings.
 4. Water Vapor Perm (ASTM E96): Less than 1 perm.
 5. Flame Spread (ASTM E84): Less than 50.
 6. Tapered: As shown on Drawings and crickets.
 7. Board Edges: Square.
 8. Product: SecureShield Polyisocyanurate as manufactured by Carlisle SynTec.

2.05 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Adhesive, Fasteners, Tape, In-Seam Sealants, Splicing Cements, Cut-off Mastic, Cleaners: As recommended or manufactured by membrane manufacturer.
- C. Termination Bar: 1" wide and .098" thick extruded aluminum bar pre-punched 6" on center with a sealant ledge to support lap sealant.

- D. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 - 1. Composition: Asphaltic with mineral granule surface or Roofing membrane manufacturer's standard.
 - 2. Surface Color: White or Yellow.

2.06 METAL ROOF EDGES

- A. Gravel Guard: SecurEdge, 24 gage, to meet performance and warranty requirements and fascia details in drawings, color selected by Architect from manufacturer's Kynar coatings.
- B. Coping: SecurEdge, 24 gage, to meet performance and warranty requirements and fascia details in drawings, color selected by Architect manufacturer's Kynar coatings.

2.07 METAL ROOF EDGE ACCESSORIES

- A. Fasteners: Same metal as flashing/sheet metal. Match finish of exposed heads with material being fastened. Type and size to suit application.
- B. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, free of sulfur, compounded for 15-mil dry thickness per coat.
- C. Sealant: Exterior quality conforming with Section 07-9005.
- D. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- E. Polyethylene Underlayment: 4-mil minimum carbonated polyethylene film tested in accordance with ASTM E154.
- F. Neoprene Washers: Required for all fasteners which will remain exposed to the weather.
- G. Metal Accessories: Sheet metal clips, continuous cleats, straps, anchoring devices, as required for installation of work, matching or compatible with adjoining materials, noncorrosive, size and gage required for performance.
 - 1. Continuous cleats: 22 gage galvanized metal, fastened 12" max. o.c., unless indicated otherwise.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and edge strips are in place.

3.02 PREPARATION - WOOD DECK

- A. Verify flatness and tightness of joints in wood decking; fill knot holes with latex filler.
- B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

3.03 INSTALLATION, GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during cold or wet weather conditions.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate this work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

3.04 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

- A. Install vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
 - 1. Extend vapor retarder under cant strips and blocking to deck edge.
 - 2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.
 - 3. Install over entire roof area for continuous barrier.
- B. Attachment of Insulation: Embed insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer in both directions.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Do not install more insulation than can be covered with membrane in same day.

3.05 INSTALLATION - MEMBRANE

- A. Gaps greater than 1/4" in substrate are to be filled with an appropriate material.
- B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching. Let sheet remain in a relaxed a minimum of 30 minutes prior to installation.
- C. Shingle joints on sloped substrate in direction of drainage.

- D. Fully Adhered Application: Apply adhesive to substrate at rate recommended by the manufacturer. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- E. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- F. At intersections with vertical surfaces:
 - 1. Extend membrane up a minimum of 4 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up and over blocking and secure as detailed on drawings.
- G. At gravel stops, extend membrane under gravel stop and to the outside face of the wall as detailed.
- H. Around roof penetrations, seal flanges and flashings with flexible flashing.
- I. Walkway Protection: Install walkway protection units at locations shown and where required for access to roof-mounted equipment.
 - 1. Do not allow membrane seams to fall under walkway pads.

3.06 SHEET METAL INSTALLATION

- A. Perform sheet metal work in accordance with approved shop drawings and installation instructions and recommendations of SMACNA "Architectural Sheet Metal Manual."
 - 1. Anchor work securely in place by methods indicated, providing for thermal expansion; conceal fasteners where possible.
 - 2. Set units true to line and level.
 - 3. Install work with laps, joints, seams watertight and weatherproof.
- B. Underlayment: For aluminum to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper or a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install counterflashing in reglets, either by snap-in seal arrangements or by wedging in place for anchorage and filling reglet with mastic or elastomeric sealant.
- E. Flashing Attachment:
 - 1. Secure all flashing 16 inches on centers.
 - 2. Install parapet cap flashing and gravel guards with continuous hold-down clips secured 12" o.c. maximum.
 - 3. Exposed fasteners: Complete with neoprene washers 16" o.c.
- F. Joints for Gravel Guards:
 - 1. Overlap base metal minimum 4 inches.
 - 2. Set in solid bed of plastic cement.
 - 3. Make allowances for expansion joints.

3.07 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements for additional requirements.
- B. Start installation in presence of manufacturer's technical representative.
 - 1. Cut out and repair membrane defects at end of each day's work.
- C. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.
- D. Wrinkled membrane in field or seams will not be accepted. Replace any sheets with wrinkles.
- E. A maximum of 3 patches are allowed in a 10 square foot area. If the patches are exceeded in an area, a minimum of a 10' by 10' membrane sheet is to be replaced.

3.08 CLEANING

- A. See Section 01-7000 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.09 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07-6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, window collar, and window subsill.
- B. Sealants for joints within sheet metal fabrications.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Product Data: Manufacturer's data sheet for factory-finished sheet metal and type of guarantee.
 - 2. Samples: 12-inch long samples of shop fabricated products with specified factory finish.
 - 3. Shop Drawings: Indicating layout, profiles, methods of joining, and anchorages details, including major counterflashings, trim/fascia units, gutters, conductor heads, downspouts, and scuppers.
 - a. Provide layouts at 1/4-inch scale and details at 3-inch scale.

1.03 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.04 MOCK-UP

- A. Mock-Up Panel: Before work in this section is started, provide exterior mock-up for Owner and Architect review and approval of all exterior finish elements materials and construction manner. Comply with provisions of Section 01-3323.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gauge, 0.032 inch thick, unless notes otherwise in schedule; plain finish shop pre-coated with fluoropolymercoating.
 - 1. Fluoropolymer Coating: High performance organic powder coating, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's standard colors.
- B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed finish.

2.02 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to prevent leakage, damage, or deterioration of the work.
- C. Form work to fit substrates.
- D. Form exposed work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- E. Form pieces in longest possible lengths.
- F. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- G. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- H. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- I. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- J. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters: SMACNA (ASMM) Rectangular profile.
- B. Downspouts: Rectangular profile.
- C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 5 years in accordance with SMACNA (ASMM).
- D. Form sections in maximum lengths, true to shape indicated, accurate in size, and free from defects. Unless indicated otherwise, a minimum ratio of the depth to width should be 3 to 4.

- E. Provide for thermal expansion and contraction. Adjacent ends shall be telescoped or enclosed with covers in a manner to accommodate expansion. Expansion shall be away from corners and downspouts.
- F. Accessories: Profiled to suit gutters and downspouts of same material as downspout and gutter.
 - 1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Brackets.
- G. Downspout Boots: Cast iron. See Section 05-5000.
- H. Seal metal joints.

2.04 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers. Match finish of exposed heads with material being fastened.
- B. Primer: Zinc chromate type.
- C. Protective Backing Paint: Zinc molybdate alkyd.
- D. Concealed Sealants: Non-curing butyl sealant.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- F. Plastic Cement: ASTM D4586/D4586M, Type I.
- G. Metal Accessories: Sheet metal clips, continuous cleats, straps, anchoring devices, as required for installation of work, matching or compatible with adjoining materials, noncorrosive, size and gage required for performance.
 - 1. Continuous cleats shall be 22 gage (0.0299 inch) galvanized metal, fastened 12 inch maximum on center, unless indicated otherwise.

2.05 FLASHING

- A. Through-wall and Counterflashings:
 - 1. Comply with details shown to fabricate sheet metal to fit substrates and result in waterproofing and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 2. Non-moving seam shall be flat locked

PART 3 EXECUTION

3.01 PREPARATION

- A. Inspection:
 - 1. Before starting the work of this section, verify other work affecting sheet metal work is complete and approved.
 - 2. Beginning of sheet metal work means acceptance of existing conditions.
- B. Install starter and edge strips, and cleats before starting installation.

- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.02 INSTALLATION

- A. Perform sheet metal work in accordance with approved shop drawings and installation instructions and recommendations of SMACNA "Architectural Sheet Metal Manual."
- B. Anchor work securely in place by methods indicated, providing for thermal expansion; using concealed fasteners where possible.
 - 1. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashings.
 - 2. Torch cutting of sheet metal flashing and trim is not permitted.
- C. Protect metal from noncompatible metal or corrosive substrates by coating with protective backing paint as recommended by manufacturer/fabricator.
 - 1. Coat side of stainless-steel sheet metal flashing with protective backing paint where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of underlayment.
 - 3. Bed flanges in thick coat of plastic cement where required for waterproof performance.
- D. Apply plastic cement compound between metal flashings and felt flashings.
- E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- F. Seal metal joints watertight.
- G. Solder stainless steel metal joints for full metal surface contact, and after soldering wash metal clean with neutralizing solution and rinse with water.
- H. Secure gutters and downspouts in place with concealed fasteners.
- I. Connect downspouts to downspout boots, and seal connection watertight.
- J. Openings Flashing: Install continuous head, sill, jamb, and similar flashings to extend 5 inches beyond wall openings.
- K. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
- L. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3.03 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.

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- C. Protection: Protect flashings and sheet metal work during construction from damage or deterioration.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.04 SCHEDULE

- A. Through-Wall Flashing in Masonry: Stainless steel drip with membrane flashing See 04-2001.
- B. Gutters and Downspouts: Pre-finished Aluminum, 24 gage.
- C. Window Collar: Stainless Steel.
- D. Window Subsill: Pre-finished Aluminum, 12 gage.

END OF SECTION

SECTION 07-9005
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sealant work as required to make exterior wall joints and similar building joints watertight.
- B. Joint sealing compound for interior work.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Indicating compliance with requirements of this Section, including installation instructions for each type of joint sealer specified.
 - 2. Selection Samples: Manufacturer's complete color range for each type of joint sealer specified. Physical samples required.
 - a. Include a list of each product proposed with the location/ conditions where the products are proposed to be used for appropriate colors to be selected at each condition.
 - 3. Laboratory Test Reports: Certified by Sealant Manufacturer indicating compliance with laboratory and field testing requirements specified in this Section under "Quality Assurance".
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Warranty: As specified elsewhere within this section.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.
- C. Laboratory Testing:
 - 1. Before starting the exterior sealant work, lab testing for adhesion is required in accordance with ASTM C794 Test Method.
 - 2. Lab testing shall be performed and certified by Sealant Manufacturer.
 - 3. All materials scheduled to come in contact with exterior sealant shall be tested with type of sealant specified.
 - 4. Sealant Manufacturer's Representative shall pick up samples at job-site after being notified by Contractor.
 - 5. Test Reports from Sealant Manufacturer shall be forwarded to Architect for distribution to Contractor and Owner.
 - 6. Lab testing shall be performed at no cost to contractor, Owner and Architect.
- D. Compatibility With Substrate: Installer shall be responsible for verifying that joint sealers used are compatible with joint substrates.

- E. Joint Tolerance: Joint width/depth are critical to joint sealer performance. Compliance with manufacturer's recommendations is required.

1.04 MOCK-UP

- A. Mock-Up Panel: Before work in this section is started, provide exterior mock-up for Owner and Architect review and approval of all exterior finish elements materials and construction manner. Comply with provisions of Section 01-3323.

1.05 PRE-INSTALLATION CONFERENCE

- A. Before work of this section is started, the Contractor shall set up and have a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after 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. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gunnable and Pourable Sealants:
 - 1. BASF Construction Chemicals-Building Systems:
www.buildingsystems.basf.com/#sle.
 - 2. Dow Corning Corporation: www.dowcorning.com/#sle.
 - 3. Tremco Global Sealants: www.tremcosealants.com/#sle.
 - 4. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.02 SEALANTS

- A. Acrylic Latex Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, non-sag, paintable with latex or oil, mildew-resistant, USDA approved.
 - 1. Modulus at 100%: 60-65 psi, ASTM D412.
 - 2. Ultimate Tensile: 80-90 psi, ASTM D412.
 - 3. Ultimate Elongation: 200%, ASTM D412.
 - 4. Movement Capability: 7-1/2% extension, 7-1/2% compression.
 - 5. Low-Temperature Flexibility: No cracking through to substrate or adhesion loss, ASTM C734.
 - 6. Adhesion Loss: 0.5%, ASTM C736.

7. Color: To be selected by Architect from manufacturer's standard range.
 8. Uses:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall and floor surfaces.
 - c. At casework joints within and to wall surfaces.
 - d. Other interior joints for which no other type of sealant is indicated.
 9. Products:
 - a. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: www.pecora.com/#sle.
 - b. Dow Corning Corporation; 786: www.dowcorning.com.
 - c. Substitutions: See Section 01-2513 Product Substitution Procedures.
- B. Sanitary Mildew Resistant Silicone Sealant: ASTM C920, Class 25; single component, neutral-curing, mildew resistant.
1. Cyclic Movement (%): +/- 50, ASTM C679
 2. Elongation, Ultimate (%): 450, ASTM D412
 3. Hardness, Shore A: 25-35, ASTM C661
 4. Ozone/UV Resistance: Excellent, weatherometer
 5. Service Temperature Range (0F): -60 to 300
 6. Tensile Strength:
 - a. 100% Elongation (psi): 45-55, ASTM C1135
 - b. Ultimate (psi): 165, ASTM C1135
 7. VOC Content (g/l): 50, ASTM D3960
 8. Color: To be selected by Architect from manufacturer's full range
 9. Uses:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
 - b. Joints between kitchen and bath countertops and wall surfaces.
 10. Products:
 - a. Pecora Corporation; 898NST Sanitary Silicone Sealant - Class 50: www.pecora.com/#sle.
 - b. Dow Corning Corporation; 786: www.dowcorning.com.
 - c. Substitutions: See Section 01-2513 Product Substitution Procedures.
- C. Medium-Modulus Silicone Exterior Wall Sealant: Type II silicone, ASTM C920, Type S, Grade NS, Class 25, Uses NT, A, G, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.
1. Movement Capability: Plus and minus 25 percent.
 2. Hardness, Shore A: 15 to 35, ASTM C661.
 3. Adhesion-in-Peel: 30 lbs. peel strength and 0% adhesion loss on glass or aluminum, ASTM C794.
 4. Ultimate Tensile Strength: 200 psi, ASTM D412.
 5. Color: To be selected by Architect from manufacturer's full range
 6. Uses:
 - a. Metal to metal.
 - b. Metal to masonry (cast stone, brick, CMU, manufactured stone).
 - c. Joints within masonry (cast stone, brick, CMU, manufactured stone)
 - d. Joints at transitions between different masonry types listed above.

7. Products:
 - a. Dow Corning Corporation; 795: www.dowcorning.com/#sle.
 - b. Pecora Corporation; 895NST Medium Modulus Structural Glazing & Weatherproofing Silicone Sealant - Class 50: www.pecora.com/#sle.
 - c. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. 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.
 1. Vertical Wall Joints: ASTM C1330; Type O - Open Cell Polyurethane.
 2. Open Cell: 40 to 50 percent larger in diameter than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 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. Measure joint dimensions and size joint backers to achieve the following at exterior installations, unless otherwise indicated:
 1. Minimum of 3/4" joint.
 2. Width/depth ratio of 2:1.
 3. Neck dimension no greater than 1/3 of the joint width.
 4. Surface bond area on each side not less than 75 percent of joint width.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave, in uniform, continuous beads without gaps, air pockets, embedded matter, ridges and sags.
- H. Use abrasive on vinyl casings to allow sealant to adhere.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-4529 - Testing Laboratory Services, for independent testing and inspection requirements. Inspection will monitor quality of installation of sealant.

3.05 CLEANING

- A. Clean adjacent soiled surfaces.

3.06 PROTECTION

- A. Protect sealants until cured.
- B. Cut out and remove damaged or deteriorated joint sealers and repair to match original work.

END OF SECTION

SECTION 08-1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-rated hollow metal frames for wood doors.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Product Data: Submit manufacturer's technical data substantiating that products comply with requirements of this Section.
 - 2. Shop Drawings: Indicate details and gages of frames, elevations of doors and frames, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show type of anchorage and accessory items.
 - a. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
 - b. Indicate cutouts where required in doors where applicable.
 - c. Indicate fire-resistance ratings where applicable.
 - d. Coordinate the work of this Section with the requirements for doors specified in other Sections of Division 8.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Each door shall be marked by manufacturers' identifying type and performance.

1.04 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.
- C. Inspect metal doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect. Remove and replace refinished units not acceptable to Architect.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:

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1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
3. Steelcraft, an Allegion brand: www.allegion.com/us.
4. Amweld International LLC: www.amweld.com
5. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 2. Accessibility: Comply with ICC A117.1 and ADA Standards and the applicable Accessibility Code.
 3. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 4. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.
- B. 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 FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Double-return Flanges: Provide for all frames.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
- E. Provisions in Frames for Door Hardware: Prepare frames at factory for installation of hardware.

1. Reinforcement Plates: Provide reinforcement plates in hollow metal frames to accommodate the installation of potential future closers and automatic operators (even if they are not specified as part of the door hardware set). Reinforcement plates are to be no less than 12 gage and no less than 12" in length.
Reinforcement plates are to be provided to accommodate standard mount door closers, parallel mount door closers and automatic operators.
- F. Anchors:
1. For Wood Stud Partitions: Four 18 gage galvanized steel, wood stud anchors at each jamb up to 7'-6" high.

2.04 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.05 ACCESSORIES

- A. 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.
- B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

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

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.
1. Except for frames located at in-place construction place frames prior to construction of enclosing walls and ceilings.
 2. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set.
 3. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 4. Install calking and sealant as specified in Section 07-9005.
- B. Coordinate frame anchor placement with wall construction.
- C. Install hardware without forcing, with proper clearances and alignment, so that operation is smooth and easy, free of binding and/or twisting.

3.04 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. After installation, Contractor shall touch-up scratched and damaged surfaces.
 - 1. Dented or bent frames and doors shall be repaired as required with metal putty, sanded and primed with type of primer to match shop coating.
 - 2. Damaged units which cannot be repaired to meet Architect's approval shall be replaced with new units.

END OF SECTION

SECTION 08-1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush configuration; non-rated.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Door Schedule: Using same reference numbers for openings as those indicated on Architect's Door Schedule.
 - 2. Shop Drawings and product data indicating:
 - a. Door Elevations.
 - b. Location and type of provisions in doors for scheduled hardware attachment.
 - c. Door construction showing type of core, type of stiles, rails, and internal blocking for hardware attachment.
 - d. Thickness and type of veneer and crossbands.
 - e. Type of finish for all door edges.
 - f. Cutouts for glazing where required in doors.
 - g. Doors with thresholds, undercut bottom edges and other special features.
 - h. Type of glass stops.
 - 3. Manufacturer's Product Data: Clearly describing full compliance with requirements of this Section including quality of door construction, core material, and face veneers.
 - 4. Samples: Submit finish samples indicating the complete finish appearance for Architects approval.
 - a. Size: 8-1/2 inches x 11 inches x 1/4 inches min.
 - 5. Coordinate the work of this Section with the requirements of frames specified in other Section of Division 8.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals.
 - 1. Warranty: As specified elsewhere within this section.

1.03 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- D. Provide doors meeting or exceeding the minimum standards as set forth by Window and Door Manufacturers Association standard, WDMA.I.S1A.
 - 1. Affix the WDMA Quality Grade Stamp to each unit of product. Display grade as specified for each Section of work.

2. Finish doors in accordance with WDMA.I.S1A Minimum Aesthetic Standard.
- E. Provide Fire doors bearing labels approved by Underwriters Laboratories, Inc (UL) or Intertek Testing (WHI).
 1. Provide labels permanently attached to either the hinge stile or to the top rail, showing testing agency approval for classification scheduled.

1.04 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, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver store, or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. HVAC systems should be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25% or greater than 55%.

1.06 WARRANTY

- A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. High Pressure Decorative Laminate (HPDL) Faced Doors:
 1. Oshkosh Door Company: www.oshkoshdoor.com
 2. Marshfield Door Systems: www.marshfielddoors.com
 3. VT Industries, Inc: www.vtindustries.com/#sle.
 4. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.02 DOORS

- A. Doors:
 1. Quality Level: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
 2. High Pressure Decorative Laminate (HPDL) Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.
2. High pressure decorative laminate finish unless noted otherwise.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
 1. Provide blocking in particleboard cores or provide structural composite lumber cores instead of particleboard cores for doors with exit devices or protection plates.
 2. Provide staved lumber core (SLC) for full-glass doors.

2.04 DOOR FACINGS

- A. High Pressure Decorative Laminate Facing for Non-Fire-Rated Doors: NEMA LD 3, HGS; color/finish as indicated on Finish Drawings.
- B. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 2. Provide solid blocking for other throughbolted hardware.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Top and bottom rails shall be factory sealed with an approved wood sealer. Site trimming of rails requires re-sealing.
- G. Provide edge clearances in accordance with the quality standard specified, unless noted otherwise.
- H. Bottom of Doors:
 1. Non-Rated Doors: 3/4 inch maximum undercut is required between bottom of doors and concrete slab. More than 3/4 inch is not acceptable.

2.06 ACCESSORIES

- A. Hollow Metal Door Frames: See Section 08-1113.
- B. Glazing: See Section 08-8000, Type S1.
- C. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamper proof screws.

- D. Door Hardware: See Section 08-7100.
- E. For doors with window lights, coordinate window height with panic hardware so that hardware does not cross window.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. 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. See Section 01-4529 for testing required.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
 - 1. Doors shall be installed plumb, and fit square in frame with maximum diagonal and vertical distortion of 1/16 inch.
 - 2. Door clearances at jambs, heads and meeting stiles of pairs of doors to be a maximum of 1/8".
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING, CLEANING AND PROTECTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.
- C. Clean-up hardware and adjacent surfaces upon completion.
 - 1. Do not use abrasive or liquid cleaners that will harm permanent finishes.
 - 2. Protect door surfaces at all times.
- D. Completed door work shall be protected from damage and deterioration until final acceptance of the Work.

END OF SECTION

SECTION 08-3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted access units, non-rated.

1.02 SUBMITTAL

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Clearly indicating general construction, thickness of metal, and finishes.

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:
 - 1. Panel Material: Steel.
 - 2. Size: 24 inch by 24 inch minimum, but as required for appropriate access.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface recessed for infill with wall finish.

2.02 WALL MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc: www.acudor.com/#sle.
 - 2. Kees Incorporated: www.kees.com
 - a. Security Units in Non-rated Walls and Ceilings: Style SD-SSAP
 - 3. Milcor, Inc: www.milcorinc.com.
 - a. Units in Non-rated Walls and Ceilings: Style DW
 - 4. Substitutions: See Section 01-2513 Product Substitution Procedures.
- 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. Style: Recessed door panel for infill with wall/ceiling finish.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
 - 2. Door Style: Single thickness with rolled or turned in edges.
 - 3. Frames: 16 gauge, 0.0598 inch, minimum thickness.

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4. Door Panels to Receive Wall/Ceiling Finish: Surface recessed 1/2 inch back from wall face.
5. Steel Finish: Primed.
6. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
7. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - b. Latch/Lock: Tamperproof tool-operated cam latch.
 - c. Gasketing: Extruded neoprene, around perimeter of door panel.

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 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 08-4229
AUTOMATIC ENTRANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged power-operated door assemblies of following types:
 - 1. Sliding type.
- B. Controllers, actuators and safety devices.
- C. Coordinate with glazing specified in Section 08-8000.
- D. Maintenance.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Shop Drawings:
 - a. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
 - b. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.
 - 2. Product Data: Indicating all information which specifies full compliance with requirements of this section, including installation instructions.
 - 3. Certification: Manufacturer and installer are certified by American Association for Automatic Door Manufacturers (AAADM).
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals.
 - 1. Warranty: As specified elsewhere within this section.
 - 2. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.
 - 3. Maintenance Materials: Furnish wrenches and other tools required for maintenance of equipment.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience and approved by manufacturer.
- C. Certification: All labor and equipment shall be provided by American Association for Automatic Door Manufacturers (AAADM) certified installers and distributors.

1.04 DELIVERY, HANDLING, STORAGE

- A. Products shall be delivered to job-site in original unopened packages bearing manufacturer's labels.

- B. Store and protect products in accordance with manufacturer's recommendations. Maintain temperature and humidity within ranges required by manufacturer's instructions.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 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 two year manufacturer warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sliding Automatic Entrance Door Assemblies:
 - 1. ASSA ABLOY Entrance Solutions; Besam SL500: www.besam-usa.com/#sle.
 - 2. Portalp USA; Diva Series: www.portalpusa.com/#sle.
 - 3. Stanley Access Technologies; Dura-Glide 2000 Sliding: www.stanleyaccesstechnologies.com/sle.
 - 4. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.02 POWER OPERATED DOORS

- A. Power Operated Doors: Provide products that comply with NFPA 101 and requirements of authorities having jurisdiction; provide equipment selected for actual door weight and for light pedestrian traffic, unless otherwise indicated.
 - 1. Sliding and Folding Door Operators: In the event of power failure, provide for manual open, close, and break-away operation of door leaves.
 - 2. Packaged Door Assemblies: Provide components by single manufacturer, factory-assembled, including doors, frames, operators, actuators, and safeties.
 - a. Finish exposed equipment components to match door and frame finish.
 - 3. Air Leakage: Maximum of 1.0 cu ft/min/sq ft of wall area, when tested in accordance with ASTM E283 at 1.57 lbs/sq ft pressure differential across assembly.
 - 4. Exterior and Vestibule Doors: Provide equipment and operator suitable for operating temperature range of minus 20 to plus 140 degrees F ambient. Operator shall be sealed against dust, dirt, and corrosion and lubricated to reduce wear and friction of moving parts.
- B. Sliding and Folding Doors with Full Power Operators: Comply with BHMA A156.10; safeties required; provide break-away operation unless otherwise indicated; in the event of break-away operation, interrupt power operation.

1. Comply with UL 325; acceptable evidence of compliance includes UL (DIR) listing.
 2. Force Required to Swing Break-Away Panel: 50 pound-force, maximum, measured at 1 inch from the latch edge of the door at any point in the closing cycle.
 3. Operator shall be belt-driven and complete with position controller and electronic control box factory-set to provide operating speeds and forces as prescribed by ANSI A156.10. Limit switches of any type not acceptable.
 4. Control box in conjunction with position sensor shall automatically set the opening and closing speeds, the opening and closing check positions and the full open and fully closed position of the door system.
 5. Time Delay: Door system shall provide a 0 to 30 seconds time delay.
- C. Operators:
1. Electric Operators: 3/16 hp minimum, self-contained, gear driven, with release clutch.
 - a. Operator shall be readily convertible to any band required.
 - b. Drive train shall have positive constant engagement.
 - c. Close Speed Control: Accomplished by dynamic braking of the motor; fully adjustable.
 - d. Motor Protection Circuit: Provided by a locked door motor protection circuit that shuts off current if applied when the door is inadvertently locked or otherwise prevented from opening; power to the motor is restored when the on/off reset switch is turned on.
- D. Locks: Installed in accordance with NFPA 101 requirements and shall not interfere with egress.
1. Key Lock: Cylinder type, keyed two sides.

2.03 AUTOMATIC ENTRANCE DOOR ASSEMBLIES

- A. Comply with applicable local building codes for egress requirements.
- B. Framing and Transom Members: Provide manufacturer's standard extruded aluminum framing, reinforced as required to support imposed loads.
1. Nominal Sizes:
 - a. Single Slide and Bi-Parting Sliding Doors: 1-3/4 inch wide by 4-1/2 inch deep.
 2. Concealed Fastening: Provide concealed fastening pocket in framing, with continuous flush insert cover extending full length of each framing member.
 3. Transoms: Provide flush glazed transom with framing that is integral with automatic entrance framing system.
- C. Door and Sidelight Construction: Heavy duty interlocked extruded aluminum tubular stile and rail sections, through-rod bolted construction with steel corner support at hinge stile of carrier-suspended swinging panels or mechanically fastened corners with welded reinforcing brackets to reduce sag in sliding or breakout mode.
1. Door Thickness: 1-3/4 inch, nominal.
 2. Stile Design:
 - a. Wide stile, 4 inch, nominal width.

3. Top Rail Height: 4 inch, nominal.
 4. Bottom Rail Height: 10 inch, nominal.
 5. Glazing Stops: Manufacturer's standard snap-on extruded aluminum square stops with preformed resilient glazing gaskets.
 6. Glazing Stop Width: Manufacturers standard.
 7. Glazing Thickness: See Section 08-8000.
- D. Sliding Automatic Door: Single leaf track-mounted, electric operation, extruded aluminum glazed door, with frame, and operator concealed overhead.
1. Operation: Power open, power close operation.
 2. Exterior-Side Actuator/Safety: Motion sensor.
 3. Interior-Side Actuator/Safety: Motion sensor.
 4. Hold Open: Toggle switch at inside head of doors.
 5. Door and Frame Finish: Same as storefront framing system.
 6. Threshold: Continuous standard tapered extrusion square by bevel, with bevel to exterior

2.04 CONTROLLERS, ACTUATORS, AND SAFETIES

- A. Controller: Provide microprocessor operated controller for each door.
1. Adjustable Time Delay: Capable of adjustable time delay of 2 to 30 seconds.
- B. Comply with BHMA A156.10 for actuator and safety types and zones.
- C. Motion Sensor Actuator/Safety: Microwave; distance of control sensitivity adjustable.
1. Overhead operator shall be complete with anti-vandalism which will insure that the change of zone size by unauthorized movement of the unit is not possible.
 2. Overhead operator shall have a discriminating signal input circuit, automatic compensation for voltage variations, and automatic rejection of fixed objects within the zone.
- D. Photo-Electric Actuator/Safety: Horizontal single ray device, with aluminum housing for light source and relay units.

2.05 ACCESSORIES

- A. Subsills for Sidelights:
1. Fabricate to shapes indicated of not less than 1/8 inch thick extruded aluminum, one piece full length of opening if practical, with concealed anchors.
 2. If not practical to use one piece, provide 6 inch long back-up plate of same material, thickness and shape as sill member. Provide for expansion and contraction. Line center of subsill with expansion joints in window mullions.
 3. Subsills turned-up back edge not less than 1 inch. Front edge provided with 1-1/2 inch (minimum) drip. End dams turned-up 1-1/2 inch.
 4. Do not bridge thermal breaks.
 5. Refer to drawings for details.
- B. Gasketing:
1. Adjustable nylon sweeps on bottom of sliding doors.

2. Double pile weatherstripping on lead edges of sliding doors including the area of lock and elsewhere as needed for a weathertight installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available and is of the correct characteristics.
- C. Beginning of entrance door work means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install equipment in accordance with approved shop drawings and manufacturer's published instructions.
- B. Provide for thermal expansion and contraction of door and frame units and live and dead loads that may be transmitted to operating equipment.
- C. Provide for dimensional distortion of components during operation.
- D. Coordinate installation of components with related and adjacent work; level and plumb.
- E. Set subsills in bed of mastic with provisions for sealant and shims.

3.03 ADJUSTING

- A. After repeated operation of completed installation, re-adjust door operators and controls for optimum condition, safety, and compliance with accessibility and governing building codes.

3.04 CLEANING

- A. Remove temporary protection, clean exposed surfaces.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.06 MAINTENANCE

END OF SECTION

SECTION 08-4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required and the following:
 - a. Elevations of aluminum/glass door and framing system
 - b. Details of construction including subsills. Method of assembling frames and subsills.
 - 2. Product Data: Indicating all technical information which specifies full compliance with requirements of this Section, including finish and installation instructions.
 - 3. Samples: Of each type of finish specified applied to minimum size 2" x 2" aluminum samples representative of the actual finish.
 - 4. Written Certification: From systems manufacturer certifying that the installer meets qualification requirements specified under Quality Assurance in this Section.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals.
 - 1. Warranty: As specified elsewhere within this section.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
 - 1. Installer: The entrance/framing system shall be installed exclusively by a firm certified in writing by entrance/framing system manufacturer.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Source Limitations: Obtain aluminum curtain wall system through one source from a single manufacturer.
- D. Aluminum Door Coordination: All finish hardware specified and furnished under Section 08-7100 shall be coordinated with the supplier of the aluminum doors and frames, specified in this section . Material shall be of the proper type and finish shall match the doors.

1.04 MOCK-UP

- A. Mock-Up Panel: Before work in this section is started, provide exterior mock-up for Owner and Architect review and approval of all exterior finish elements materials and construction manner. Comply with provisions of Section 01-3323.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

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 failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. 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 -- FRAMING FOR INSULATING GLAZING

- A. Front-Set Style, Thermally-Broken:
 - 1. Basis of Design: Kawneer Company, Inc; Trifab Versagalze 451T: www.kawneer.com.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
 - 2. YKK AP America Inc.: www.ykkap.com.
 - 3. Tubelite Inc: www.tubeliteinc.com.
 - 4. Oldcastle Building Envelope: www.oldcastlebe.com
- C. Substitution Procedures: See Section 01-2513 Product Substitution Procedures.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

- A. Front-Set Style:
 - 1. Basis of Design: Kawneer Company, Inc; Trifab Versaglaze 451:
www.kawneer.com.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. Trulite Glass and Aluminum Solutions, LLC; _____: www.trulite.com/#sle.
 - 2. YKK AP America Inc.: www.ykkap.com.
 - 3. Tubelite, Inc: www.tubeliteinc.com.
 - 4. Oldcastle Building Envelope: www.oldcastlebe.com
- C. Substitutions: See Section 01-2513 Product Substitution Procedures.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 BASIS OF DESIGN -- SWINGING DOORS

- A. Wide Stile, Monolithic Glazing:
 - 1. Basis of Design: Kawneer Company, Inc; 500 Heavy Wall Series:
www.kawneer.com.
 - 2. Thickness: 2 inches.
- B. Wide Stile, Insulating Glazing, Thermally-Broken:
 - 1. Basis of Design: Kawneer Company, Inc; 560 Insulclad Series:
www.kawneer.com.
 - 2. Thickness: 2-1/4 inches.
- C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
 - 1. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
 - 2. YKK AP America Inc: www.ykkap.com.
 - 3. Tubelite Inc: www.tubeliteinc.com.
 - 4. Oldcastle Building Envelope: www.oldcastlebe.com
- D. Substitutions: See Section 01-2513 Product Substitution Procedures.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.04 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Rabbet: See Section 08-8000 for types.
 - 2. Finish: Superior performing organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

ALUMINUM-FRAMED STOREFRONTS 08-4313 - 4

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3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 9. Closure: Frame to have solid back with thermal break.
 10. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.
 11. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.
- B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of the applicable building code and structural drawing requirements.
 - b. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
 2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf.
 3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
 4. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
 5. Condensation Resistance Factor of Framing: 60, minimum, measured in accordance with AAMA 1503.
 6. Overall U-value Including Glazing for Exterior Units: _____ Btu/(hr sq ft deg F), maximum.

2.05 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 - 1. Framing members for interior applications need not be thermally broken.
 - 2. Glazing Stops: Flush.
 - 3. Cross-Section: As indicated on drawings.
- B. Glazing: See Section 08-8000.
 - 1. For Exterior Framing: Type IG-1 and IG-2. See drawings for locations.
 - 2. For Interior Framing: Type S-1.
- C. Swing Doors: Glazed aluminum.
 - 1. Top Rail: 5 inch wide.
 - 2. Vertical Stiles: 5 inch wide.
 - 3. Bottom Rail: 10 inches wide.
 - 4. Glazing Stops: Beveled.
 - 5. Glass Thickness: See Section 08-8000; Type IG-2 and S-1.
 - 6. Finish: Same as storefront.
- D. Manufacturer's Subsill: Manufacturer's standard thermally broken subsill with end-dams.
- E. Architectural Subsill Extensions:
 - 1. See Section 07-6200 for metal specification.
 - 2. Fabricate to shapes as shown, one piece full length of opening if practical, with concealed anchors.
 - 3. If not practical to use one piece, provide 6" long back-up plate of same material, thickness and shape as sill member. Provide for expansion and contraction. Line with expansion joints in window mullions.
 - 4. Do not bridge thermal breaks.
 - 5. Refer to drawings for details.

2.06 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- C. Fasteners: Stainless steel in accordance with ASTM B633.
- D. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch minimum thickness.
- E. Perimeter Sealant: See Section 07-9005.

- F. Window Anchors: Stainless steel or manufacturer's standard filler plates/ window anchors (solid backing) are required for attachment at head and jamb members of all glazed framing systems.
- G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- H. Glazing Accessories: See Section 08-8000.

2.07 FABRICATION

- A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fit joints; make joints flush, hairline and weatherproof.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible
- B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- C. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- D. Storefront Framing: Fabricate components for assembly using manufacturer's standard installation instructions.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.08 FINISHES

- A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
- B. Color: As selected by Architect from manufacturer's full range.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.09 HARDWARE

- A. For each exterior door, include weatherstripping, sill sweep strip, threshold, and drips.
- B. Other Door Hardware: See Section 08-7100.

- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section. Beginning of work means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Seal joints watertight unless otherwise indicated. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- C. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- D. Provide alignment attachments and shims to permanently fasten system to building structure.
- E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- F. Provide thermal isolation where components penetrate or disrupt building insulation.
- G. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- H. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- J. Set thresholds in bed of sealant and secure.
- K. Install glass in accordance with Section 08-8000, using glazing method required to achieve performance criteria.
- L. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-4529 - Testing Laboratory Services, for independent field testing and inspection requirements and requirements for monitoring quality of specified products.

3.05 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.06 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.
- B. Repair or replace damaged installed products.

END OF SECTION

SECTION 08-7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood and aluminum doors.
- B. Electrically operated and controlled hardware.
- C. Lock cylinders for doors that hardware is specified in other sections.
- D. Weatherstripping, seals and door gaskets.
- E. Automatic Entrances hardware is specified in Section 08-4229.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Convey Owner's keying requirements to manufacturers.
- D. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.03 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Hardware Schedule: Complete materials list of all items proposed to be furnished and delivered under this Section.
 - a. Identify each item by manufacturer, catalogue number and location in the work, hand, finish, etc. using door opening designation shown on drawings.
 - b. Architect's approval of Hardware Schedule shall not relieve Contractor of the responsibility to furnish all necessary hardware.
 - 2. Manufacturer's Product Data: Indicating full compliance with requirements of this Section.
 - a. Catalog "cut-sheets" shall be marked to clearly identify hardware scheduled.
 - b. Substitutions: When submitting products of a manufacturer other than those listed in the Hardware Schedule, furnish cut-sheets of the scheduled item as well as the corresponding proposed substitution.
 - 3. Shop Drawings: For electrified and electronic hardware provide the following at each hardware set:
 - a. Electrical characteristics and connection requirements, including point-to-point wiring and riser diagrams showing component connections using color coding of manufacturer especially prepared for the Project.
 - b. Differentiate between manufacturer-installed and field-installed wiring.

- c. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - d. Include requirements for system test and check out procedures.
 - e. Written narrative explaining the function of each opening shall appear within each hardware schedule heading containing electrified hardware.
4. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
 5. Installation Instructions: For items requiring special field preparation, such as in-wall blocking for attachment of wall-mounted door stops, submit two copies.
 6. Templates: After hardware schedule is approved, deliver hardware templates or physical samples to pertinent suppliers of interfacing items such as doors and frames.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
1. Warranty: As specified elsewhere within this section.
 2. Tools and Instructions for Maintenance: Furnish a complete set of specialized tools and instructions needed for Owner's continued adjustment, maintenance and removal and replacement of builders hardware.
 3. Final Hardware and Keying Schedule: Provide hardware and keying of schedule actual installation conditions.

1.04 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 the products specified in this section with minimum five years of experience.
- C. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with five years of experience. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.
- D. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.
- E. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.
 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

- F. Aluminum Door Coordination: All finish hardware specified and furnished under this section shall be coordinated with the supplier of the aluminum doors and frames, specified in Section 08-4313. Material shall be of the proper type and finish shall match the doors.
- G. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Marking: Individually package each unit of finish hardware, complete with proper fastenings and appurtenances, clearly marked on the outside to indicate the contents and specific locations in the work. The hardware supplier shall meet at the jobsite with the installer prior to commencing installation of hardware, for explanation of packing, labeling and hardware schedule data, if required. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.06 PRE-INSTALLATION CONFERENCES

- A. Prior to starting door hardware rough-in work, the General Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Door Hardware Pre-Installation Conference"
- B. Keying Conference: Keying conference to be a meeting with the Owner, Contractor and door hardware supplier and incorporate the following criteria into the final keying schedule document. Conference may be held in conjunction with the pre-installation conference.
 - 1. Purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.

1.07 WARRANTY

- A. Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking or breakage.
 - 2. Faulty operation of operators and door hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.

- B. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- C. Special Warranty Periods:
 - 1. Five years for exit hardware.
 - 2. Five years for electric strikes.
- D. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 PRODUCTS

2.01 MANUFACTURERS - BASIS OF DESIGN

- A. For the purpose of designating the minimum aesthetic, functional and quality standards for the work of this Section, proprietary products are specified.
- B. Substitutions: Products of manufacturers listed in this Section are acceptable only after compliance with requirements of this Section and with substitution requirements in Section 01-2513 Product Substitution Procedures.

2.02 GENERAL REQUIREMENTS

- A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated the Hardware Schedule and Specialized Door Narrative in Section 08-7000.01.
- B. Provide all items of a single type of the same model by the same manufacturer, unless noted otherwise.
- C. Provide products that comply with the following:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Accessibility: ADA Standards and ICC A117.1 and applicable Accessibility Code
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
 - 3. Applicable provisions of NFPA 101, Life Safety Code.
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.
 - 4. Auxiliary Hardware: BHMA A156.16.

5. Straps, Tee Hinges and Hasps: BHMA A156.20.
 6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated and noted in NFPA 70.
- D. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.
- E. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.
- F. Designations: Requirements for design, grade, function, finish, size and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturer's names are abbreviated in the Door Hardware Schedule.
 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality and function.
 3. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers which comply with requirements including those specified elsewhere in this Section.
- G. Materials and Fabrication:
1. Hand of Door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as indicated.
 2. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable name plates), except in conjunction with required UL labels and as otherwise acceptable to Architect/Engineer.
 - a. Manufacturer's identification will be permitted on rim of lock cylinders only.
 3. Fasteners: Manufacturer's hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self tapping sheet metal screws, except as specifically indicated. Provide threaded-to-the-head wood screws for fastening hardware on wood doors.
 - a. Furnish screws for installation, with each hardware item. Provide phillips head screws except as otherwise indicated.
 4. Finish exposed (exposed under any condition) fasteners to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

5. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce work. Where through bolting is necessary follow ANSI A250.6-1997.
- H. Screws:
1. Furnish phillips head all purpose or machine screws for installation of units, except furnish Phillips head all purpose or wood screws for installation of units into wood.
- I. Finishes: Provide door hardware of the same finish unless otherwise indicated.
1. Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
 2. Secondary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
 3. Exceptions:
 - a. Aluminum Surface Trim and Gasket Housings: Anodized to match door, not to match other hardware.
 - b. Hardware for Aluminum Storefront Doors: Finished to match door, except hand contact surfaces to be satin stainless steel.

2.03 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 5. Keyway: Match facility standard.
- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Key locks to Owner's existing system.

- E. Keying: Master keyed.
 - 1. Include construction keying.
 - 2. Establish a new key system for this project allowing for future expansion.
 - 3. Supply keys in the following quantities:
 - a. 5 master keys per level/ group.
 - b. 10 construction keys.
 - c. 2 change keys for each cylinder.
 - 4. When providing keying information, comply with DHI Handbook "Keying systems and nomenclature".
- F. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cylinders. Provide construction master keys in quantity as required by project Contractor. Replace construction cylinders with permanent cylinders. Furnish permanent cores for installation as directed under specified "Keying Conference".
- G. Key Registration List: Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
- H. Manufacturers - Cylinders/ Keyway:
 - 1. dormakaba Best (BE): www.bestaccess.com.
 - 2. No substitution

2.04 HANGING DEVICES

- A. Hinges: Provide hinges on every swinging door.
 - 1. Provide non-removable pins on outswinging interior doors at access control or lockable locations.
 - 2. Provide wide throw hinges when trim is applied to frame face or an inset frame condition exists. Provide wide throw hinges when double egress doors are indicated to swing greater than 90 degrees.
- B. Butt Hinges: Comply with BHMA A156.1 and A156.7; standard weight, steel, unless otherwise indicated.
 - 1. Heavy weight, non-ferrous hinges to be provided on exterior doors, unless Hardware Schedule indicate standard weight.
 - 2. Provide hinge width required to clear surrounding trim.
- C. Quantity of Hinges Per Door:
 - 1. Doors up to 60 inches High: Two hinges.
 - 2. Doors From 60 inches High up to 90 inches High: Three hinges.
 - 3. Doors 90 inches High up to 120 inches High: Four hinges.
 - 4. Doors over 120 inches High: One additional hinge per each additional 30 inches in height.
- D. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - 1. Widths up to 36 inches: 4 1/2 inch standard or heavy weight as specified.
 - 2. Sizes from 37 inch to 48 inches: 5 inch standard or heavy weight as specified.
- E. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

1. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 2. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- F. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
- G. Manufacturers - Hinges:
1. Assa Abloy Brands; McKinney (MK); TA/T4A Series: www.mckinneyhinge.com.
 2. Hager Companies (HA); BB Series: www.hagerco.com.
 3. dormakaba Best (BE); F/FBB Series: www.bestaccess.com.

2.05 CONTINUOUS HINGES

- A. Geared Continuous Hinges: ANSI/BHMA A156.26 certified continuous geared hinge with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations.
1. Manufacturers - Geared Continuous Hinges:
 - a. Hager Companies (HA): www.hagerco.com.
 - b. Pemko Manufacturing (PE): www.pemko.com.

2.06 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Hardware Schedule. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
1. Manufacturers - Quick Connect Transfer Hinges:
 - a. Hager Companies (HA); ETW-QC (12 wires) Option: www.hagerco.com.
 - b. Assa Abloy Brands; McKinney Products (MK); QC (12 wires) Option: www.assaabloydss.com.
- B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a 12 inch removable panel cutout accessible without demounting the door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Hardware Schedule. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
1. Manufacturers - Quick Connect Continuous Geared Transfer Hinges:
 - a. Pemko Companies (PE); SER-QC (12 wires) Option: www.pemko.com.
 - b. Assa Abloy Brands; McKinney Products (MK); SER-QC (12 wires) Option: www.assaabloydss.com.

- C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
1. Provide one each of the following tools as part of the base bid contract:
 - a. Assa Abloy Brands; McKinney Products (MK); Electrical Connecting Kit QC-R001: www.mckinneyhinge.com.
 - b. Assa Abloy Brands; McKinney Products (MK); Connector Hand Tool QC-R003 www.mckinneyhinge.com.
 2. Manufacturers - Door Wire Harness:
 - a. Assa Abloy Brands; McKinney Products (MK); QC-C Series: www.mckinneyhinge.com.
 - b. Stanley Hardware (ST); WH Series; www.stanleyhardware.com.
 - c. Hager Companies (HA); Quick Connect: www.hagerco.com.

2.07 PUSH/PULLS

- A. Push/Pulls: Comply with BHMA A156.6.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in Hardware Schedule, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the Hardware Schedule. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the Hardware Schedule. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
- B. Manufacturers - Push/Pulls:
1. Burns Manufacturing (BU): www.burnsmfg.com
 2. Rockwood Manufacturing (RO): www.rockwoodmfg.com
 3. Trimco (TC): www.trimcohardware.com

2.08 CYLINDRICAL LOCKSETS

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified cylindrical (bored) locksets furnished in the functions as specified in the Hardware Schedule. Lock chassis fabricated of heavy gauge steel, zinc dichromate plated, with through-bolted application. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt. Locks are to be non-handed and fully field reversible.

- B. Knurling: Where required by local code provide knurling or abrasive coating to all levers on doors leading to hazardous areas such as mechanical rooms, boiler and furnace rooms, janitor closets, and as otherwise required or specified.
- C. Manufacturers - Cylindrical Locksets:
 - 1. Best Access Systems, division of Stanley Security Solutions (BE); 9K Series: www.bestaccess.com.
 - 2. Assa Abloy Brands; Sargent (SA); 10X Line: www.sargentlock.com

2.09 AUXILIARY LOCKS (DEADBOLTS)

- A. Narrow Case Deadlocks and Deadlatches: ANSI/BHMA 156.13 Series 1000 Grade 1 narrow case deadlocks and deadlatches for swinging or sliding door applications. All functions shall be manufactured in a single sized case formed from 12 gauge minimum, corrosion resistant steel (option for fully stainless steel case and components). Provide minimum 2 7/8" throw laminated stainless steel bolt. Bottom rail deadlocks to have 3/8" diameter bolts.
 - 1. Manufacturers - Mortise Deadlocks, Narrow Case:
 - a. Assa Abloy Brands; Adams Rite (AD); MS1850S/MS1950 Series: www.adamsrite.com.

2.10 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
 - 4. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.11 ELECTRIC STRIKES

- A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 1500 lbs. of static strength and 70 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike where specified.
 - 1. Manufacturers - Standard Electric Strikes:
 - a. Assa Abloy Brands; HES (HS); 1500/ 1600 Series: www.hesinnovations.com.
- B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a (5) five year warranty.

2.12 EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Schedule.
 - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Schedule.
 - 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is not acceptable except in any case where the door light extends behind the device as in a full glass configuration.
 - 5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty trim with cold forged escutcheons, beveled edges, and four threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Schedule, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.
 - b. Where function of exit device requires a cylinder, provide an interchangeable core type keyed cylinder (Rim or Mortise) as specified in Hardware Schedule.
 - 6. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.
 - 7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

8. Dummy Push Bar: Non-functioning push bar matching functional push bar.
 9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 10. Through Bolt Installation: For exit devices and trim as indicated in Hardware Schedule.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Schedule. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.
- C. Electrified Conventional Push Rail Devices (Heavy Duty): Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified below.
1. Electrified Options: As indicated in Hardware Schedule, provide electrified exit device options including: electric latch retraction , electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.
- D. Manufacturers - Exit Devices (Heavy Duty):
1. Assa Abloy Brands; Sargent (SA); 80 Series: www.sargentlock.com.
 2. dormakaba Best (BE); Apex 2000 Series: www.bestaccess.com.

2.13 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Schedule.
 - a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.

- b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
 - c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
 - d. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Schedule.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Manufacturers - Door Closers:
 - a. Assa Abloy Brands; Sargent (SA); 351 Series: www.sargentlock.com
 - b. Allegion Brands; LCN Door Closers (LC); 4040 Series: www.allegion.com/us.
 - c. Norton Door Controls (NO); 7500 Series: www.nortondoorcontrols.com

2.14 STOPS AND HOLDERS

- A. Stops: Provide a stop for every swinging door, unless otherwise indicated.
1. Provide wall stops, unless otherwise indicated.
 2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
 3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.
 4. Do not mount floor stops where they will impede traffic.
 5. For overhead stops, track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
- B. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Schedule. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
1. Manufacturers - Overhead Holders/Stops:
 - a. Assa Abloy Brands; Rixson (RF): www.rixson.com.
 - b. Rockwood Manufacturing (RO): www.rockwoodmfg.com.

- c. Assa Abloy Brands; Sargent (SA): www.sargentlock.com.
- C. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Schedule.
 - 1. Manufacturers - Wall and Floor Stops/holders:
 - a. Burns Manufacturing (BU): www.burnsmfg.com
 - b. Trimco (TC): www.trimcohardware.com.
 - c. Rockwood Manufacturing (RO): www.rockwoodmfg.com

2.15 GASKETING AND THRESHOLDS

- A. Gaskets: Complying with BHMA A156.22.
 - 1. General: Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
 - 2. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 3. On doors indicated as "sound-rated", "acoustical", or with an STC rating, provide sound-rated gaskets and automatic door bottom listed and labeled based on testing according to ASTM E 1408; make gaskets completely continuous, do not cut or notch gaskets for installation.
 - 4. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- B. Manufacturers - Gasketing and Thresholds:
 - 1. National Guard Products, Inc (NG): www.ngpinc.com.
 - 2. Pemko Manufacturing Co (PE): www.pemko.com.
 - 3. Zero International, Inc (ZE): www.zerointernational.com.

2.16 PROTECTION PLATES AND ARCHITECTURAL TRIM

- A. General: Door protective trim units to be of type and design as specified below or in the Hardware Schedule.
- B. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Schedule.
- C. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications

- D. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), eased on four edges, fabricated from the following:
 - 1. Stainless Steel: 300 series, 050-inch thick, with countersunk screw holes (CSK).
- E. Options and Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Schedule. Provide countersunk screw holes.
- F. Manufacturers - Protection Plates and Architectural Trim:
 - 1. Burns Manufacturing (BU): www.burnsmfg.com
 - 2. Trimco (TC): www.trimcohardware.com.
 - 3. Rockwood Manufacturing (RO): www.rockwoodmfg.com

2.17 ELECTRONIC ACCESSORIES

- A. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.
 - 1. Manufacturers - Push-Button Switches:
 - a. Assa Abloy Brands; Alarm Controls (AK); TS Series: www.alarmcontrols.com.
 - b. Assa Abloy Brands; Securitron (SU); PB Series: www.securitron.com.

2.18 KEY CONTROLS

- A. Facility Manager's Key Cabinet: Sheet steel construction, piano hinged door with key lock.
 - 1. Mounting: Wall-mounted.
 - 2. Capacity: Actual quantity of keys, plus 50 percent additional capacity.
 - 3. Horizontal metal hook strips with replaceable labels covered with clear plastic.
 - 4. Size key hooks to hold 6 keys each.
 - 5. Finish: Baked enamel, manufacturer's standard color.
 - 6. Key cabinet lock to building keying system.
 - 7. Manufacturers - Key Controls:
 - a. Lund Equipment (LU): www.lundkeycab.net.
 - b. MMF Industries (MM): www.mmfind.com.
 - c. Telkee (TK): www.telkee.com.
- B. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into "Key Wizard" software.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until finishes applied to substrate are complete.
- D. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- E. Mounting heights for hardware from finished floor to center line of hardware item.
 - 1. For steel doors and frames: Comply with DHI (LOCS) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames".
 - 2. For Wood Doors: Comply with DHI WDHS.3 "Recommended Locations for Architectural Hardware for Flush Wood Doors".
 - 3. Comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
- F. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- G. Set all closer to 5lbs of force to open, maximum.

3.03 FIELD QUALITY CONTROL

- A. Provide an Architectural Hardware Consultant to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions, is functioning properly and as specified.

3.04 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.
- B. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

3.06 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.07 PROTECTION

- A. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08-7100.01
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware schedule for Hardware specified in section 08-7100.

PART 2 PRODUCTS - SEE SECTION 08-7100.

PART 3 EXECUTION – SEE SECTION 08-7100.

PART 4 – DOOR HARDWARE SCHEDULE

4.01 SPECIALIZED DOOR NARRATIVE GENERAL NOTES

A. General

1. The notes in the specialized door narrative are intended as functional design intent only. Contractor to provide all components to provide full functionality as described below, including astragals, gaskets, or any other accessories required to achieve listed ratings, as well as all relays, transformers, keypads, cylinders, etc. to achieve door operation as described, regardless of whether such accessories have been specifically named in the hardware schedule.
2. Contractor to coordinate installation of separate functions to verify all systems work and can function as an integral system. Contractor to notify Architect, Engineer, door hardware consultant & appropriate subcontractors of any conflicts that arise during installation.
3. Any inconsistencies noted between the specialized door narrative and the hardware schedule shall be brought to the attention of the Architect at the time of bid.
4. Only a small portion of the doors in the hardware schedule are addressed. Coordinate with hardware schedule and door schedule.
5. Review keying and security requirements with the Owner.
6. Line voltages and control voltages provided at door openings, when required, under the work of Division 26 shall be 120V. Additional transformers or accessories, if required, shall be provided by the same trade which provides the hardware, door, or equipment being operated.
7. If a specific function is noted as not being required, however, the hardware needed for other functions that are required deem the specific function necessary, then the function is to be provided.

4.02 SPECIALIZED DOOR NARRATIVE

- 001 (No Rating) Exterior vestibule sliding doors at main entry, closed during normal operating hours and secured after hours. Doors to have complete break-out function. Automatic operation is required from both sides, sensors to activate.

DOOR HARDWARE SCHEDULE 08-7100.01-2
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Doors to be secure via key. Egress to always be possible through break-out function. No magnetic hold opens required.

101A (No Rating) Interior vestibule sliding doors at main entry, closed during normal operating hours. Doors to have complete break-out function. Automatic operation is required from both sides, sensors to activate. Egress to always be possible through break-out function. No magnetic hold opens required.

002, 003, 004, 005

(No Rating) Exterior control door, closed and secured during normal operating hours. Door to be secured such that access from the exterior is via access control system. Egress to always be possible. No magnetic hold open or automatic operation required.

121, 500A, 500B

(No Rating) Control door, closed and secured during normal operating hours. Door to be secured such that access from the Hallway is via access control system. Egress to always be possible. No magnetic hold open or automatic operation required.

190, 191

(No Rating) Control door, closed and secured during normal operating hours. Door to be secured such that access from Wait 101 is via access control system or remote release from desk at Recept 105. Egress to always be possible. No magnetic hold open or automatic operation required.

214A, 215, 292, 293, 490, 494, 990

(No Rating) Control door, closed and secured during normal operating hours. Door to be secured such that access from the Vest 215/ Hall 292/ Testing 294/ Hallway 390 is via access control system. Egress to always be possible. No magnetic hold open or automatic operation required.

290 (No Rating) Control door, closed and secured during normal operating hours. Door to be secured from both sides via access control system. Door release on fire alarm or sprinkler activation. No magnetic hold open or automatic operation required.

4.03 HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Manufacturer Abbreviations:
 1. AD – Adams Rite
 2. BE - Best
 3. HS - HES
 4. MK - McKinney

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- 5. PE – Pemko
- 6. RF – Rixson
- 7. RO – Rockwood
- 8. SA – Sargent
- 9. SU – Securitron

C. Hardware Schedule:

Hardware Sets

Set: 1.0

Doors: 001, 101A

Description: EXT ENTRY - AUTO SLIDER

1 Push Button	PB	SU
1 HBO	All hardware by door manufacturer	00

Notes:

Set: 2.0

Doors: 002, 003, 004, 005

Description: EXT EGRESS - ALUM - EAC

1 Continuous Hinge	CFMXXSLF-HD1 QCXX	PE
1 Rim Exit Device, Storeroom	55 56 72 AD8504 Less Pull	US32D SA
1 Interchangeable Core	Core	US15 BE
1 Door Pull	BF168	US32D RO
1 Surface Closer	351 PS	EN SA
1 Gasketing	by door / frame mfg	
1 Threshold	2005AT MSES25SS	PE
1 Door Switch	By Operator Mfg.	
1 ElectroLynx Harness (door)	QC-C x L.A.R.	MK
1 ElectroLynx Harness (frame)	QC-C1500	MK
1 Power supply	By security vendor- Div 28	
1 Card reader	By security vendor- Div 28	

Notes: Balance of hardware: threshold, door seals, door sweeps and mounting brackets furnished by storefront door manufacturer. Verify finish of hardware.

Door normally closed and secured.

Authorized credential retracts the latchbolt to allow free entry, door relocks upon closing. REX (request to exit) switch in device rail allow for free exit at all times

Entry by key override at all times

Door is fail secure

Set: 3.0

DOOR HARDWARE SCHEDULE 08-7100.01-4
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Doors: 006

Description: EXT EGRESS - ALUM [INSWING]

1 Continuous Hinge	CFM83SLF-HD1		PE
1 Mortise Deadlock	MS1850SN X 4066	628	AD
1 Interchangeable Core	Core	US15	BE
1 Cylinder	Cylinder	US32D	BE
1 Push Bar & Pull	11047	US32D	RO
1 Door Closer	351 Reg / PA	EN	SA
1 Door Stop	446 / 409 as required	US26D	RO
1 Gasketing	by door / frame mfg		
1 Threshold	271A MSES25SS		PE

Notes: Balance of hardware: threshold, door seals, door sweeps and mounting brackets furnished by storefront door manufacturer. Verify finish of hardware.

Set: 4.0

Doors: 290

Description: CORR - EAC - CR IN/OUT

3 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Utility/Asylum/Institutional Lock	70 10XG17 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Electric Strike	1500C-LM x 2005m3	630	HS
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO
1 Power supply	By security vendor- Div 28		
2 Card reader	By security vendor- Div 28		

Notes: Confirm this door is not in a path of egress.

Door normally closed.

Electric strike operated by activating the card reader which then releases the strike. The strike relatches after pre determined time.

Door is fail secure.

Set: 5.0

Doors: 215, 490

Description: CORR - EAC

2 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
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DOOR HARDWARE SCHEDULE 08-7100.01-5
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1 Hinge, Full Mortise	TA2714 QCXX 4-1/2" x 4-1/2"	US26D	MK
1 Rim Exit Device, Storeroom	55 56 72 8804 ETL	US32D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO
1 ElectroLynx Harness (door)	QC-C x L.A.R.		MK
1 ElectroLynx Harness (frame)	QC-C1500		MK
1 Power supply	By security vendor- Div 28		
1 Card reader	By security vendor- Div 28		

Set: 6.0

Doors: 190, 191, 214B
 Description: LOBBY / WAIT - EAC

1 Hinge (heavy weight)	T4A3786 QC12 5" x 4-1/2"	US26D	MK
2 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Fail Secure Lock	10XG71 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO
1 ElectroLynx Harness (door)	QC-C x L.A.R.		MK
1 ElectroLynx Harness (frame)	QC-C1500		MK
1 Power supply	By security vendor- Div 28		
1 Card reader	By security vendor- Div 28		
1 Push Button	PB		SU

Notes: Presenting a valid credential releases the lever to allow free entry, door relocks upon closing. REX (request to exit) switch in the lock allow for free exit at all times
 Entry by key override at all times
 Door can be leased by remote button located per architect.
 Door is fail secure

Set: 7.0

Doors: 121, 292, 293, 494, 500A, 500B, 990
 Description: ENTRY / PASSAGE - EAC

2 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
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DOOR HARDWARE SCHEDULE 08-7100.01-6
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1 Hinge, Full Mortise	TA2714 QCXX 4-1/2" x 4-1/2"	US26D	MK
1 Fail Secure Lock	10XG71 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO
1 ElectroLynx Harness (door)	QC-C x L.A.R.		MK
1 ElectroLynx Harness (frame)	QC-C1500		MK
1 Power supply	By security vendor- Div 28		
1 Card reader	By security vendor- Div 28		

Set: 8.0

Doors: 214A

Description: WAITING - EAC

1 Continuous Hinge	CFM83SLF-HD1		PE
1 Deadlatch	4900 X 4591	628	AD
1 Interchangeable Core	Core	US15	BE
1 Cylinder	72 as required	US32D	SA
1 Electric Strike	1500C-LM x 2005m3	630	HS
1 Push Bar & Pull	11047	US32D	RO
1 Door Closer	351 Reg / PA	EN	SA
1 Door Stop	446 / 409 as required	US26D	RO
1 Gasketing	by door / frame mfg		
1 ElectroLynx Harness (frame)	QC-C1500		MK
1 Power supply	By security vendor- Div 28		
1 Card reader	By security vendor- Div 28		

Notes: Electric strike operated by activating the card reader which then releases the strike. The strike relatches after pre determined time.

Set: 9.0

Doors: 204, 205, 208, 210, 213, 216, 217, 305, 306, 315, 325, 326, 408, 409

Description: OFFICE

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Entry/Office Lock	70 10XG05 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

DOOR HARDWARE SCHEDULE 08-7100.01-7
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Notes: 2046 to have std wt hinges.

Set: 10.0

Doors: 106A, 106B

Description: WORK RM

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	70 10XG37 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

Set: 11.0

Doors: 122

Description: HOUSEKEEPING

3 Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom/Closet Lock	70 10XG04 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

Set: 12.0

Doors: 314

Description: LAB

3 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Classroom Lock	70 10XG37 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Mop Plate	K1050 4" x 1" LDW	US32D	RO
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
1 Gasketing	S88BL		PE

Set: 13.0

Doors: 120

Description: ELEC

DOOR HARDWARE SCHEDULE 08-7100.01-8
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3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	70 10XG37 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 CPSH	EN	SA
3 Silencer	608		RO

Notes: ADVISE ROOM AMPS

Set: 14.0

Doors: 123, 324

Description: EQUIP

3 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Passage Latch	10XU15 LL	US26D	SA
1 Door Closer	351 Reg / PA	EN	SA
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

Set: 15.0

Doors: 201, 202, 203, 301, 302, 303, 304, 311, 312, 313, 321, 322, 323, 331, 332, 333, 334, 401, 402, 403, 404, 405, 406, 407, 421, 422, 423, 424, 425, 426, 427

Description: EXAM / TREATMENT

3 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Passage Latch	10XU15 LL	US26D	SA
1 Mop Plate	K1050 4" x 1" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

Set: 16.0

Doors: 308A, 308B, 328A, 328B, 416A, 416B, 417

Description: CLEAN / SOILED

3 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Storeroom/Closet Lock	70 10XG04 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
1 Gasketing	S88BL		PE

Set: 17.0

Doors: 206A, 206B, 418, 420

DOOR HARDWARE SCHEDULE 08-7100.01-9
 Freestanding Medical Office Building for SCCH – 23987.02

Description: STOR / IT

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	70 10XG37 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

Set: 18.0

Doors: 209

Description: MEDS

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom/Closet Lock	70 10XG04 LL	US26D	SA
1 Interchangeable Core	Core	US15	BE
1 Door Closer	351 Reg / PA	EN	SA
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

Set: 19.0

Doors: 906

Description: CONF

3 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Passage Latch	10XU15 LL	US26D	SA
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

Set: 20.0

Doors: 901

Description: LOCKER

3 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Push Plate	70C	US32D	RO
1 Pull Plate	BF 110x70C	US32D	RO
1 Door Closer	351 Reg / PA	EN	SA
1 Mop Plate	K1050 4" x 1" LDW	US32D	RO
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
3 Silencer	608		RO

Set: 21.0

Doors: 212, 309, 310, 329, 330, 413, 414, 419

DOOR HARDWARE SCHEDULE 08-7100.01-10
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Description: TOILET

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Privacy Lock	10XU65 LL	US26D	SA
1 Mop Plate	K1050 4" x 1" LDW	US32D	RO
1 Door Stop	446 / 409 as required	US26D	RO
1 Gasketing	S88BL		PE

Set: 22.0

Doors: 102, 103, 207A, 207B, 902, 903, 904, 905

Description: TOILET (OHS)

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Privacy Lock	10XU65 LL	US26D	SA
1 Surface Overhead Holder - Stop	9-X36	630	RF
1 Kick Plate	K1050 8" x 2" LDW	US32D	RO
1 Gasketing	S88BL		PE

END OF SECTION

SECTION 08-8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data on Glass Types: Physical, structural, environmental characteristics, size limitations, special hardening or installation requirements.
 - 2. Glass Samples: 8"x8" of each type specified.
 - 3. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Warranties: As specified elsewhere within this section.

1.03 QUALITY ASSURANCE

- A. Glass Manufacturer Qualifications: Provide materials produced by a single manufacturer or fabricator with a minimum of ten years experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- C. Labels: Each piece of glass shall bear manufacturer's label showing strength, grade thickness, type and quality.
- D. When glass is not cut to size by manufacturer and is furnished unlabeled from local stock, submit affidavit stating quality, thickness, type and manufacturer of glass furnished.
- E. Insulating Glass Certification Program: Provide certification label of Insulating Glass Certification Council (IGCC).

1.04 JOB MOCK-UP

- A. Mock-Up Panel: Before work in this section is started, provide exterior mock-up for Owner and Architect review and approval of all exterior finish elements materials and construction manner. Comply with provisions of Section 01-3323.

1.05 PRE-INSTALLATION CONFERENCE

- A. Prior to starting roofing and exterior envelope work, the General Contractor shall set up a job site meeting to comply with provisions of Section 01-3119 for the "Envelope and Roofing Pre-Installation Conference".

1.06 WARRANTY

- A. See Section 01-7800 - Closeout Submittals, for additional warranty requirements.
- B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.
 - 1. Written warranty shall also guarantee the quality of sealed glass units meets or exceeds SIGMA "Specification for Sealed Insulating Glass Units."
 - 2. Warranty period of 10 years shall begin when seal date is permanently imprinted on sealed glass units, but the sealed glass units shall be guaranteed for not less than 9 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 INSULATING GLASS UNITS

- A. Type IG-1 - Sealed Insulating Glass Units: Vision glass, double glazed.
 - 1. Application: All exterior glazing unless otherwise indicated.
 - 2. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Gray
 - 3. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E type, on #3 surface.
 - 4. Total Thickness: 1 inch.
 - 5. Total Visible Light Transmittance: 42 percent, nominal.
 - 6. Total U-Value: 0.46, maximum.
 - 7. Total Solar Heat Gain Coefficient: 0.32, maximum.
 - 8. Glazing Method: Gasket glazing.
- B. Type IG-2 - Sealed Insulating Glass Units: Vision glazing, Tempered
 - 1. Applications: All exterior glazing indicated to be tempered.
 - 2. Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.

2.02 GLAZING UNITS

- A. Type S-1 - Single Vision Glazing:
 - 1. Application: All interior glazing unless otherwise indicated.
 - 2. Type: Fully tempered float glass.
 - 3. Tint: Clear.
 - 4. Thickness: 1/2 inch.
 - 5. Glazing Method: Interior wet method, glazing compound.

2.03 EXTERIOR GLAZING ASSEMBLIES

- A. Performance Criteria: Select type and thickness of glass to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: In accordance with applicable codes as noted on structural drawings.

2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 4. Glass thicknesses listed are minimum.
- B. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:
1. In conjunction with vapor retarder and joint sealer materials described in other sections.
 2. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2.04 GLASS MATERIALS

- A. Float Glass Manufacturers:
1. AGC Glass Company North America, Inc: www.us.agc.com/#sle.
 2. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 3. Guardian Industries Corp: www.sunguardglass.com/#sle.
 4. Pilkington North America Inc: www.pilkington.com/na.
 5. PPG Industries, Inc: www.ppgideasapes.com/#sle.
 6. Oldcastle Glass, Inc: www.oldcastleglass.com.
 7. PPG Industries Industries, Inc: www.ppg.com
 8. Substitutions: Refer to Section 01-2513 Product Substitution Procedures.
- B. Float Glass: Provide float glass based glazing unless noted otherwise.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
 3. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.
 4. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.

2.05 SEALED INSULATING GLASS UNITS

- A. Manufacturers:
1. Any of the manufacturers specified for float glass.
 2. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
 3. Substitutions: Refer to Section 01-2513 Product Substitution Procedures.
- B. Sealed Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Edge Spacers: Aluminum, bent and soldered corners.
 3. Edge Seal: Glass to elastomer.
 4. Purge interpane space with dry hermetic air.

2.06 GLAZING COMPOUNDS

- A. Manufacturers:
 - 1. Pecora Corporation: www.pecora.com/#sle.
 - 2. Substitutions: Refer to Section 01-2513 Product Substitution Procedures.
- B. Silicone Sealant : Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; Color to match adjacent material.
 - 1. Product: Pecora 895

2.07 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; hardness range of 5 to 30 cured Shore A durometer; coiled on release paper; black color.
 - 1. Width: As required for application.
 - 2. Thickness: As required for application.
 - 3. Spacer Rod Diameter: As required for application.
- D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; black color.
- E. Glazing Clips: As required for details in drawings..
- F. Glazing Angle: Aluminum angle, 3/4 inch tall, 3/4 inch wide..
 - 1. Product: CR Laurence Company, Inc; D1628 Series: www.crlaurence.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.
- E. Install sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. In general, glazing work shall be in accordance with procedures in GANA "Glazing Manual". Glaze in temperature above 40 degrees. Sash shall be clean and dry. Setting blocks shall be at one-fourth points.
- B. Glass shall be cleanly cut, free of edge chips or irregular cleavages, to prevent "built-in" fatigue or stress patterns.
- C. Allow edge clearance for expansion, deflection and racking. Install without binding, warping or straining.

3.04 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

- A. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
- B. Locate and secure glazing pane using spring wire clips.
- C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.06 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.07 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION

SECTION 09-2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Indicating all technical information which specifies full compliance with requirements of this Section, including installation instructions.
 - a. Include all accessories noted in Section.
 - 2. Certifications:
 - a. Submit certification of compliance with sound requirements indicated.
Provide additional verification certification as follows:
 - 1) Compliance with local and governing codes.
 - b. Submit certification for materials origination as indicated in Quality Assurance in this Section.

1.03 JOB CONDITIONS

- A. Maintain temperature in areas where work is being performed between 55 and 70 deg F for 24 hours before, during, and after gypsum board and joint treatment.
- B. Provide ventilation during and following application of adhesives and joint treatment.
- C. Protect wet-applied materials from drying too fast.

1.04 QUALITY ASSURANCE

- A. Material Origination: The raw materials origination within the gypsum panels as well as the manufacturing of the panels to occur within the United States of America.
- B. General: Gypsum board manufactured of synthetic materials containing phosphate slag is not acceptable.
- C. Where gypsum board systems with fire-resistance ratings are indicated or required, comply with detailed drawings and/or in accordance with local and state codes if they are more stringent to produce a satisfactory fire-rated system.
- D. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum three years of experience.
- E. Notify Local inspecting authorities and Architect 7 days prior to beginning the installation of gypsum board.

1.05 DELIVERY, HANDLING, STORAGE

- A. Products shall be delivered to job-site bearing manufacturer's labels.
- B. Store materials inside, under cover, in a dry place.
 - 1. Stack flat, off floor, on boards.
 - 2. Support gypsum boards to prevent sagging.
 - 3. Store adhesives and joint material in a warm, dry place in accordance with manufacturer's printed instructions.
 - 4. Overloading floors is prohibited.

1.06 SEISMIC REQUIREMENTS

- A. Comply with applicable tables, charts, Cp values, importance factors, and other requirements.
- B. For attachments, welds, bolts, screws and other required connections, comply with applicable codes and standards.
- C. Refer to Architectural and Structural Drawings for special seismic requirements.
- D. Use construction methods required to meet seismic requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. See PART 3 for finishing requirements.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 METAL FRAMING MATERIALS

- A. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
 - 1. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.
 - a. Products:
 - 1) ClarkDietrich; RC Deluxe Resilient Channel: www.clarkdietrich.com/#sle.
 - 2) Phillips Manufacturing Co; RC-2 Resilient Sound Channel: www.phillipsmfg.com/#sle.
 - 3) Substitutions: See Section 01-2513 Product Substitution Procedures.

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board: Basis of Design products by USG Corporation, www.usg.com. Products by the following manufacturers are acceptable if they meet the requirements of this section.

1. CertainTeed Corporation: www.certainteed.com.
 2. Georgia-Pacific Gypsum: www.gpgypsum.com.
 3. National Gypsum Company: www.nationalgypsum.com.
 4. Temple-Inland : www.templeinland.com
- B. Gypsum Wallboard - General: 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, as indicated below.
 2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 3. Water Resistance: Designed by manufacturer for water resistance in the applications noted.
 - a. Water-resistant gypsum board is required immediately adjacent to all janitor's sinks.
 4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned, however weather protection is provided.
 5. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 6. Fire-Rated Paper-Faced Products (use unless otherwise noted):
 - a. USG Corporation; Sheetrock Brand Firecode Core, Type "X"
 7. Water-Resistant Glass Mat Faced Products:
 - a. USG Corporation; Fiberock Brand Aqua-Tough
 8. Mold-Resistant Glass Mat Faced Products:
 - a. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough Firecode X.

2.04 GYPSUM WALLBOARD ACCESSORIES

- A. Provide all accessories required to complete in accordance with Contract Documents.
- B. Acoustic Insulation: As specified in Section 09-8100.
- C. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
 1. For Mechanical Spaces: BA-98-Acoustical sealant manufactured by Pecora Corporation.
 2. For Sound Walls: Acoustical Latex AIS-919 sealant manufactured by Pecora Corporation.
 3. For Sound Walls with STC Rating of 50 or Higher: Green Glue Noiseproofing Sealant as manufactured by CertainTeed Corporation
- D. Noiseproofing Accessories for Sound Walls with STC Rating of 50 or Higher:
 1. Acoustical Putty Pad for Penetrations:
 - a. Product: PABCO Gypsum; QuietPutty: www.quietrock.com.
- E. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.

1. Types: As detailed or required for finished appearance.
 2. Products:
 - a. Same manufacturer as framing materials.
- F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners where indicated in installation.
 2. Joint Compound: Setting type, field-mixed.
- G. High Build Drywall Surfacers: Vinyl acrylic latex-based coating for brush, roller or spray application, designed to take the place of skim coating and separate paint primer in achieving Level 4.5 finish.
1. Products:
 - a. USG Corporation; Sheetrock Brand First Coat Primer: www.usg.com.
 - b. Substitutions: See Section 01-2513 Product Substitution Procedures.
- H. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates to which drywall construction attaches or abuts for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Verify that climate conditions including status of building envelope completion comply with manufacturers recommendations. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 1. Place one bead continuously on substrate before installation of perimeter framing members.
 2. Place continuous bead at perimeter of each layer of gypsum board.

3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

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.
 1. Attach all gypsum board with screws 3/8" to 1/2" from edges and space at no more than 8" on center at edges and 12" in the field. Drive screws so head rests in slight dimple without cutting face paper or fracturing core.
 2. Bring boards into contact but do not force into place; fit neatly and carefully.
 3. Stagger edge joints on opposite side of partition so they occur on different framing members.
 4. Proceed with attachment from board center toward ends and edges.
 5. Make all cuts neatly.
- B. Single-Layer Nonrated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.
 1. Exception: Gypsum board at tub or shower locations may be installed horizontally to avoid cut ends at tops of tubs or shower bases.
- C. At Floor Slab:
 1. For Rated and Non-Rated Walls: Leave 1/4" space between floor slab and bottom edge of gypsum board.
 2. Sound Insulated Walls: Set gypsum board in continuous bed of acoustical sealant, at floor and vertical intersection.
- D. At Exterior Walls:
 1. Where penetrations are necessary in gypsum board wall completely seal and tape to maintain integrity of wall and vapor retarder.
- E. At Control Joints:
 1. Where double studs are installed to create control joints, leave 1/2" separation between gypsum boards for installation of control joint units.
 2. Install the specified control joints in accordance with manufacturer's published instructions.
- F. At Bottom of Deck:
 1. Where wallboard extends to bottom of floor or roof deck install to allow for deflection as indicated on detail drawings.
- G. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- H. Water-Resistant Gypsum Board:
 1. When ceramic tile and/or quarry tile are scheduled on the exterior wall with a vapor barrier in toilets install water-resistant board in lieu of tile backer board.
 2. Treat cuts, edges of utility holes, fastener beads, joints and intersections with thinned tile adhesive.
 3. Do not install water resistant gypsum board on ceiling. Use regular 5/8" Type "X" gypsum board.

- I. Installation on Wood Framing: For nonrated assemblies, install as follows:
 - 1. Single-Layer Applications: Screw attachment.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces, as indicated in drawings and as follows:
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 - 2. In corridors, align control joint with outside edge of door frame.
- B. Corner Beads: Install at external corners, using longest practical lengths.

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. Finish gypsum board in accordance with levels defined in ASTM C840, summarization and applications as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish, where accent lighting is shown shining on a wall, on radiused surfaces and other areas specifically indicated.
 - a. Joints and Interior Angles: Tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Apply smoothly with no tool marks and ridges.
 - b. Fastener Heads and Accessories: Cover with three separate coats of joint compound.
 - c. Surface: Apply a thin skim coat of joint compound or a material manufactured especially for this purpose. Finish smoothly with no tool marks and ridges. Paint primer is required.
 - 2. Level 4.5: Where gloss, semi-gloss, enamel, satin or non textured flat paints are indicated.
 - a. Level 4.5 to be used at contractor's option to a level 5 at noted locations.
 - b. Joints and Interior Angles: Embed tape in joint compound and apply two separate coats of joint compound over flat joints and apply one separate coat of joint compound over interior angles. Apply smoothly with no tool marks and ridges.
 - c. Fastener Heads and Accessories: Cover with three separate coats of joint compound.
 - d. Surface: Apply one coat of high build drywall surfacer.
 - 3. Level 4: Walls and ceilings to receive flat paint finish or wall coverings, unless otherwise indicated.
 - a. Joints and Interior Angles: Embed tape in joint compound and apply two separate coats of joint compound over flat joints and apply one separate coat of joint compound over interior angles. Apply smoothly with no tool marks and ridges.

- b. Fastener Heads and Accessories: Cover with three separate coats of joint compound.
- c. Surface: Paint primer is required.
- 4. Level 3: Walls to receive textured wall finish.
 - a. Joints and Interior Angles: Embed tape in joint compound and apply one additional coat of joint compound over joints and interior angles. Apply smoothly with no tool marks and ridges.
 - b. Fastener Heads and Accessories: Cover with two separate coats of joint compound.
 - c. Surface: Paint primer is required.
- 5. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - a. Joints and interior angles: Embed tape in joint compound and wipe with a joint knife. Leave a thin joint compound coating over joints and interior angles.
 - b. Fastener Heads and Accessories: Cover with a coat of joint compound.
 - c. Surface: Remove excess joint compound. Tool marks and ridges acceptable.
- 6. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
 - a. Joints and interior angles: Set tape in joint compound.
 - b. Surface: Remove excess joint compound. Tool marks and ridges acceptable.
- 7. Level 0: Temporary partitions.
 - a. No taping, finishing, or accessories required.
- C. 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.
 - 2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
- D. Where Level 4.5 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 in any direction.

END OF SECTION

SECTION 09-5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.
- C. Coordinate the layout and installation of suspended grid components and ceiling panels with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partitions systems (if any).

1.03 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Indicating all technical information which specifies full compliance with requirements of this Section, including installation instructions for grid system and ceiling panels.
 - 2. Samples: 6" x 6" sample of each type of ceiling panel.
 - 3. Qualification data for firms to demonstrate their capabilities and experience. Include list of completed projects, addresses, names of Architects and Owners.
 - 4. Certifications: Manufacturer's certifications that products comply with specified requirements including laboratory reports for tests and standards indicated.
 - 5. Shop drawings: Indicating grid layouts, and locations of hangers, clips hanger and other accessories needed to meet specified seismic requirements.
- B. Follow Sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Extra Stock: As specified elsewhere within this section.

1.04 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years experience.
- B. Installer: Suspended acoustical ceiling work shall be performed by a firm with a minimum of three years of successful experience in the type of work specified in this Section.

- C. Seismic Performance: Provide acoustical ceiling system that has been evaluated by an independent party and found to be compliant with the local building code for the seismic requirements indicated on Structural Drawings

1.05 DELIVERY, HANDLING, STORAGE

- A. Do not deliver ceiling panels to job-site until the temperature conditions specified under "Environmental Requirements" of this Section are complied with.
- B. Products shall be delivered to job-site in original unopened packages bearing manufacturer's labels and in accordance with Section 01-6000.
- C. Store and protect ceiling grid components in accordance with manufacturer's recommendations and Section 01-6000.
 - 1. Store ceiling panels in the environmental conditions required under "Environmental Requirements" of this Section.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not begin installation until all wet work such as concrete is completed and thoroughly dried out. Building areas to receive ceilings shall be free of construction dust and debris.
- B. Maintain uniform temperature of 60 degrees F to 85 degrees F, and maximum humidity of 40 percent at least one week prior to, during, and after acoustical unit installation until Substantial Completion.

1.07 EXTRA MATERIALS

- A. Provide extra ceiling tile and grid pieces in quantities indicated on Finish Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A; FS SS-S-118B; ASTM E84, Flame Spread 25 or under.
- B. Vinyl Faced Acoustical Panels, Type AC-2: Mineral fiber with membrane-faced overlay, with the following characteristics:
 - 1. Classification: ASTM E1264 Type IV.
 - a. Form: 2, water felted.
 - b. Pattern: "E" - lightly textured.
 - 2. Manufacturer: As indicated on Finish Drawings.
 - 3. Surface Design/Finish/Size/Edge: As indicated on Finish Drawings.

4. NRC Range: 0.50 to 0.55, determined in accordance with ASTM E1264.
 5. Ceiling Attenuation Class (CAC): 35-40, determined in accordance with ASTM E1264.
 6. Color: White.
 7. Suspension System Type 1: Exposed grid.
- C. Sound Reducing Acoustical Panels, Type AC-1: Glass fiber with membrane-faced overlay, with the following characteristics:
1. Classification: ASTM E1264 Type XII.
 - a. Form: 2, cloth.
 - b. Pattern: "E" - lightly textured.
 2. Manufacturer: As indicated on Finish Drawings.
 3. Surface Design/Finish/Size/ Edge: As indicated on Finish Drawings.
 4. NRC Range: 0.90 to 1.0, determined in accordance with ASTM E1264.
 5. Ceiling Attenuation Class (CAC): 26, determined in accordance with ASTM E1264.
 6. Color: White.
 7. Suspension System Type 1: Exposed.

2.03 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
 - b. Aluminum Grid: Aluminum sheet, ASTM B209/B209M.
 2. Finish: All steel roll-formed parts, including cap, shall be chemically cleaned, electrogalvanized and protective-conversion coated. All exposed surfaces, except aluminum, shall then receive a baked polyester finish. Aluminum caps shall be etched and receive a lacquer finish.
- C. Exposed Suspension System, Type 1: Hot-dipped galvanized steel grid with aluminum cap.
1. Application(s): Seismic.
 2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 3. Profile: Tee; 15/16 inch face width.
 4. Finish: Baked enamel.
 5. Color: White.
 6. Products:
 - a. Prelude XL.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.
- E. Perimeter Moldings: Same metal and finish as grid.
 - 1. Size: As required for installation conditions and specified Seismic Design Category.
- F. Metal Edge Trim for Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
 - 1. Trim at window: 6 inch or 12 inch height, straight, extruded aluminum alloy 6063 trim channel with perimeter trim for drywall.
 - 2. Trim for Square Panel: Knife Edge: 6 inch wide horizontal face, extruded aluminum alloy 6063 trim channel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Verify that conditions are adequate to be able to meet seismic requirements.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, and ASTM E580/E580M and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.
- D. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
 - 1. If fixtures or components are too heavy to be supported from ceiling grid, then the fixtures or components shall be supported directly from building structure.
- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
- F. Where round obstructions occur, provide preformed closures to match perimeter molding.
- G. Install hold-down clips on panels within 20 ft of an exterior door.

3.04 ADJUSTMENTS AND CLEANING

- A. Adjust any sags or twists which developed in the ceiling systems.
- B. Clean exposed surfaces of grid systems and ceiling panels, including trim and edge moldings.
 - 1. Comply with manufacturer's published instructions for cleaning and touch-up of minor damage to finish.
- C. Remove and replace work which cannot be successfully cleaned and repaired to a condition which permanently eliminates evidence of damage.

END OF SECTION

SECTION 09-6100
MOISTURE VAPOR EMISSION CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Moisture Vapor Emission (MVE) Control System for Concrete.
 - 1. Exterior rated, no moisture limit, trowel grade mortars to repair concrete prior to application of MVE Control coating.
 - 2. Static and dynamic concrete crack repair materials.
 - 3. Fluid-applied, resin-based, membrane-forming coating controlling the moisture vapor emission rate (MVER) of the following:
 - a. Interior suspended concrete slabs.
 - b. Interior slab on grade.
 - c. Interior light weight slabs.
 - 4. Bond promoting primer for non-absorbent substrate to receive cementitious underlayments.
 - 5. Self-leveling floor underlayment.
- B. See Section 01-2100 for use of Floor Moisture Mitigation Allowance.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Describing preparation, storage and installation instructions and recommendations as well as compliance with this Section for each product to be used.
 - 2. Qualification Data:
 - a. Qualification Data: Dates that Contractor's on-site personnel received training by the moisture vapor control system manufacturer.
 - b. Submit list of at least three similar projects performed by the Contractor within the previous three years that used the same products and similar moisture vapor control system and self-leveling underlayment.
 - c. Pre-Installation Moisture Vapor Test Reports.
 - d. Field Quality Control Reports including Moisture Vapor Tests and Bond Strength Pull Tests on coatings and repair mortars.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Warranty: Written warranty and supporting letter as specified elsewhere within this section.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 years manufacturing concrete resurfacing and rehabilitation products. Employs factory trained personnel who are available for product knowledge training.
- B. Installer Qualifications: Minimum two years installing similar products.

- C. Coordination: A pre-construction, coordination of trades meeting. Assure compatibility of MVE control coatings with other concrete chemicals specified.

1.04 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.
- B. Discuss contract document requirements, moisture tests, manufacturer recommendations, installer's recommendations, scheduling, and protection of work from damage by other trades.
- C. Attendance required by: Contractor, Floor Installer, Manufacturer's Representative, Independent testing agency, Concrete Subcontractor, Ready Mix supplier.
- D. Objective of conference is:
 - 1. Review methods and procedures.
 - 2. Tour job site representative areas to inspect and discuss condition of substrate.
 - 3. Review concrete finishing requirements.
 - 4. Review and finalize construction schedule.
 - 5. Review required inspections, testing, certifications, material usage procedures.
 - 6. Review environmental restrictions and forecasts
 - 7. Record content of conference including attendance and topics.
- E. Furnish record of pre-installation conference to all parties who are affected by MVE control systems work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation. Record product codes and batch numbers and shelf life.
- B. Store products in a dry area with temperature maintained between 50 degrees F and 85 degrees F and protect from direct sunlight.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate and ambient temperature, but not less than 50 degrees F and not more than 90 degrees F at least 48 hours before use.
- B. Maintain ambient air temperature and relative humidity in installation areas within range recommended in writing by manufacturer, but not less than 50 degrees F or more than 90 degrees F and not less than 40 or more than 60 percent air relative humidity for 48 hours before, during installation, and for 48 hours after installation, unless longer period is recommended in writing by manufacturer.
- C. Install where concrete surface temperature will remain a minimum of 5 degrees F higher than the dew point for ambient temperature and relative humidity conditions in installation areas for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.

1.07 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.08 WARRANTY

- A. Manufacturer's lifetime limited commercial warranty for products being free from defects and failure under normal usage when products are installed under manufacturer's guidelines. Warranty shall include reimbursement for labor and material replacement, including flooring material.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturer:
 - 1. MAPEI Americas: www.mapei.com/US-EN.
- B. Alternate Manufacturers: Products of the following or other manufacturers may be submitted for review in accordance with Section 01-2513 Product Substitution Procedures.
 - 1. ARDEX AMERICAS: www.ardexamericas.com.

2.02 MOISTURE VAPOR EMISSION (MVE) CONTROL SYSTEM

- A. Components of MVE Control System from single source manufacturer. Do not mix products from different manufacturers. Subject to compliance with requirements, provide the following:
 - 1. Concrete Repair Mortar: Repair mortar to be exterior rated with no moisture limitations for use to repair concrete prior to application of MVE control system.
 - a. Minimum compressive strength after 24 hours, ASTM C109 and C109M: greater than 2700 psi.
 - b. Minimum compressive strength after 28 days, ASTM C109 and C109M: greater than 4000 psi.
 - c. Basis of Design: MAPEI Mapecem Quickpatch with Planicrete UA additive.
 - 2. Crack Repair Resin for Static Non-Moving Joints:
 - a. Basis of Design: MAPEI PLANIBOND EBA.
 - b. Thickening with sand is acceptable.
 - 3. Crack Repair for dynamic movement joints:
 - a. Basis of Design: MAPEI Mapeflex P1 SL One-Component, Self-Leveling Elastomeric Polyurethane Sealant.
 - 4. MVE Control Epoxy Coating Component: ASTM F3010 qualified, fluid-applied, two-component, 100 percent solids epoxy resin, low viscosity, penetrating, one-coat membrane forming system; formulated for application on concrete substrates to reduce moisture vapor emission rate (MVER) to level required for installation of floor covering indicated, including adhesives.
 - a. Basis of Design: MAPEI "Planiseal VS".

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- b. Suitable moisture reduction barrier to treat substrate moisture levels that exceed the manufacturers of subsequent flooring recommendations for all flooring specified.
- c. Moisture Vapor Barrier Performance Attributes:
 - 1) Performance for MVER, ASTM F1869: up to 25 lbs per 1000 square feet per 24 hours and reduces transmission rates to less than 3 lbs.
 - 2) Performance for Relative Humidity, ASTM F2170: up to 100 percent RH.
 - 3) Viscosity: Less than 250 cps.
 - 4) Pull Off, Bond Strength, Concrete Adhesion, ASTM D7234: Greater than 1000 psi at 28 days with failure in concrete substrate.
 - 5) Permeability, ASTM E96: Less than or equal to 0.1 perm at greater than 10 mil Dry Film Thickness.
 - 6) Reduction of Moisture Vapor Transmission, ASTM E96: Greater than 96 percent at 10 mil Dry Film Thickness.
 - 7) Alkali Resistance, ASTM D1308: No affect up to pH 14 at 14 days
- 5. Bond Promoting Primer over non-absorbent MVE Control Epoxy Coating to receive up to 3/8 inch thickness of Self-Leveling Underlayment:
 - a. Basis of Design: MAPEI Primer T.
- 6. Self-Leveling Underlayment: Underlayment to be shrinkage compensated to smooth and flatten floors while creating a blotter layer. Blotter layer, an absorptive layer required for water-based floor covering adhesives used to install finish floors.
 - a. Minimum compressive strength after 24 hours, ASTM C109 and C109M: greater than 2000 psi.
 - b. Minimum compressive strength after 28 days, ASTM C109 and C109M; greater than 4100 psi.
 - c. Basis of Design: MAPEI Ultraplan 1 Plus.
- 7. Final Skim Coat: As needed prior to installing floor finish.
 - a. Basis of Design: MAPEI Planiprep SC.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
 - 1. Allow at least 7 days after placement of concrete to begin this Work.
- B. Examine substrates and conditions for compliance with requirements for maximum moisture RH content ASTM F2170, and/or MVE ASTM F1869 per the floor covering manufacturer.
- C. Verify slab has not been contaminated.
- D. Record and document the following:
 - 1. Perform water bead test and photographically record contact angle of water bead meniscus to the floor to ensure concrete is hydrophilic.
 - 2. Record alkalinity testing per ASTM F710.
 - 3. Record ambient air RH, dew point and temperature.
 - 4. Record slab temperature.

- E. Concrete substrates must be structurally sound, solid, and meet industry standards as defined in ACI Committee 201 Report "Guide to Durable Concrete."
- F. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- G. Proceed with installation only after unsatisfactory conditions have been corrected. Installation of moisture control system indicates acceptance of surfaces and conditions.

3.02 PREPARATION TESTING

- A. Pre-installation Testing by independent Testing Agency: Testing performed by an C. International Concrete Repair Institute (ICRI) Concrete Moisture Testing Technician - Grade 1.
 - 1. Engage a qualified testing agency to perform tests.
- B. Alkalinity Testing: Perform pH testing according to ASTM F710.
 - 1. Install MVE control system in areas where pH readings are less than 7.0 and greater than 9.0.
- C. Moisture testing: Conform to ICRI test standards for three tests in the first 1000 square feet and one test per 1000 square feet after that. Perform no fewer than three tests in each installation area and with tests evenly spaced in installation to best represent the widest range of conditions.
 - 1. Perform Anhydrous Calcium Chloride Test: ASTM F1869.
 - 2. Perform Internal Relative Humidity Testing: ASTM D2170.
 - 3. Install MVE Control System in locations where concrete substrate MVE or RH exceeds limits recommended by flooring manufacturer.
- D. Bond Testing: Install minimum 100 square feet test area of complete assembly of MVE Control System bonded to prepared concrete substrate. Proceed with installation if tensile bond strength on MVE Control System is greater than 200 psi in heavy commercial traffic and 150 psi for normal foot traffic when tested in accordance with ASTM C1583.

3.03 SURFACE REPARATION

- A. Moisture Vapor Emission (MVE) Control System:
 - 1. Clean and prepare concrete substrate according to MVE control system manufacturer's written instructions to ensure adhesion of systems to concrete.
 - 2. For direct application of epoxy MVE control coating without mechanical profiling, concrete must be porous, have a Concrete Surface Profile (CSP) of 2 to 3 as defined by ICRI, and be in pristine condition with no contamination present.
 - 3. Mechanically remove coatings and other substances that are incompatible with MVE control systems and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by MVE control systems Manufacturer. Do not use solvents. Do not acid etch. Mechanically remove troweled CSP 1 finish. Concrete surface must be mechanically profiled using dustless, engineer-approved methods to obtain a CSP of 2 to 3.

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- a. Method One: Achieve ICRI 310.2R Minimum CSP 3 by shot blasting using apparatus that abrades the concrete surface with shot, contains the dispensed shot within the apparatus and recirculates the shot by vacuum pickup. Shot-blast with spherical steel shot SAE size range 230 - 300 as necessary to produce the required profile. Remove all residual shot with a magnet. Use a handheld grinder to CSP 2 only in areas that cannot be reached with bead blasting.]
 - b. Method Two: Achieve ICRI 310.2R Minimum CSP 2 by diamond grinding that abrades the concrete surface. Remove all dust by vacuuming with high-efficiency particulate arrestance (HEPA) filter.
4. Excessively weak, soft, dusty, cracked, or uneven surfaces may not be suitable substrates and may require additional concrete removal techniques such as scarification and then patching prior to application of the MVE Control System.
 5. Asbestos abated slabs may have hydrophobic organic compounds in the capillaries of the concrete which will be a bond break for coatings. Microscopic petrographic examination according to ASTM C856 to evaluate the concrete condition, potential deleterious substances and suitability for shot-blasting and coating adhesion.
 6. Reinforcing fibers that become visible after shot blasting must be removed and vacuumed leaving no fibers exposed above the concrete surfaces.
 7. Do not install MVE Control System if substrate testing reveals unacceptable conditions.
 8. Ensure that all old adhesives, contaminants, curing compounds, oils, silicates, dust and other bond breakers are completely removed.
 9. Remove dust and debris by broom sweeping and then vacuuming with high-efficiency particulate arrestance (HEPA) filter. Do not use sweeping compound as they contain oils and wax that would contaminate the concrete surface and inhibit bond of MVE Control System.
 10. After shot blasting, repair damaged and deteriorated concrete according to MVE control system manufacturer's written instructions.
 11. Prior to application of MVE Control Epoxy Coating, fill substrate surface depressions, ruts, spalls and other irregularities with exterior grade patch.
 12. Do not skim coat entire concrete slab prior to application of epoxy MVE control system.
 13. Allow concrete to off-gas after bead blasting for a minimum of 24 hours but no more than 48 hours to avoid contamination by other trades. Failure to wait may result in the epoxy coatings ability to perform as a MVE control due to pin-holing, blisters and fish-eyes.

3.04 CRACK PREPARATION

- A. Record location of cracks, both static and dynamic, on shop drawings.
- B. Do not apply MVE control system across substrate expansion, isolation, and other dynamic moving joints.

- C. Mechanically prepare non-moving control and construction joints with a diamond crack-chasing/concrete-cutting blade. Overcut joint width to obtain a sound, clean edge. Clean cracks or joints with oil-free compressed air and dustless high-efficiency particulate arrestance (HEPA) filter vacuum to completely remove contaminants following American Concrete Institutes's ACI RAP Bulletin 2, "Crack Repair by Gravity Feed with Resin".
- D. Pre-filling static thin random drying shrinkage cracks less than 0.01 inch width and not vertically displaced is not required. Apply MVE Control Epoxy Coating Component normally over areas of thin shrinkage cracked concrete.
- E. Fill static cracks narrower than 0.125 and not vertically displaced with MVE Crack Repair Resin. Fill cracks with 20 to 30 sieve size clean washed kiln dried sand and apply MVE Crack Repair Resin.
- F. Fill static cracks wider than 0.125 and not vertically displaced with high-modulus epoxy MVE Crack Repair Resin; thickened with sand to create an epoxy mortar.
- G. Should contraction, control or saw-cut joint dormant joints appear not filled flush to top of surface after installation of MVE Crack Repair Resin, fill static non-moving joints with high-modulus MVE Crack Repair Resin. Fill joints full-depth and flush to surface.
- H. Fill dynamic joints with self-leveling polyurethane sealant Crack Repair. Do not span movement joint with self-leveling underlayment nor flooring.
- I. Reinforcing fibers that become visible after crack preparation must be removed and vacuumed leaving no fibers exposed above the concrete surface.

3.05 MIXING

- A. Choose all appropriate safety equipment before use.
- B. Premix Part A to a homogenous consistency for 2 to 3 minutes using a low-speed mixer and a paint mixer mixing paddle.
- C. Pour Part B into the Part A container and mix thoroughly to smooth, homogenous consistency. Do not mix at high speeds, which can trap air within the mixed material.
- D. Pour the entire mixed unit onto the substrate within 5 minutes of mixing. Mixed Moisture Reduction Barrier will generate dangerous amounts of heat when cured in mass. Do not leave mixed Moisture Reduction Barrier in the mixing container longer than 5 minutes, in order to avoid premature curing and excessive heat generation.

3.06 PROTECTION - OTHER SURFACES

- A. Protect walls, floor openings, electrical openings, door frames, and other obstructions during the installation.

3.07 INSTALLATION

- A. Moisture vapor emission (MVE) control system.
 - 1. General: Install MVE control system according to ASTM F3010 and manufacturer's written instructions to product a uniform, monolithic surface free of surface deficiencies such as pin holes, fish eyes and voids.

2. Adjust application methods per manufacturer's written instruction as determined by site conditions, presence of sub-slab vapor barrier, concrete mix design, lightweight aggregates, suspended slab vs slab on grade, and age of concrete.
3. Refer to the Safety Data Sheet (SDS) for details on handling and safety equipment.
4. Mixing: Mix in accordance with Manufacturer's instructions. Mix only full units. Strictly follow minimum mixing time.
5. In a single coat application, apply MVE control system epoxy to manufacturer's recommended rate with no less than dry film thickness of 10 mils minimum to achieve design perm rating.
6. Cure MVE Control System components according to the manufacturer's written instruction. Prevent contamination or other damage during curing processes.
7. After curing, examine MVE control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.

3.08 FIELD QUALITY CONTROL

- A. Inspect MVE Control System to ensure that all voids and pinholes are filled and sealed before moving on to the next flooring phase. Do so by filling any voids and or shaving off the tops of any bubbles and reapplying a thin coating of MVE Control System over the surface. Verify no bond break present.

3.09 INSTALLATION OF PRIMER FOR SELF-LEVELER

- A. Self-Leveling Underlayment up to 3/8 inch thickness: Apply Bond Promoting Primer to epoxy MVE control system and allow primer to dry completely.

3.10 INSTALLATION OF SELF-LEVELING UNDERLAYMENT

- A. Read all installation instructions thoroughly before installation.
- B. Before installation, close doors and windows, and turn off HVAC systems to prevent drafts during application and until the floor cures. Protect areas from direct sunlight.
- C. Make sure concrete substrate and ambient room temperatures are between 50 and 95 degrees F before application. In large applications, allow for indirect air circulation to dissipate humidity created by leveler application. Temperatures must be maintained within this range for at least 72 hours after the installation of self-leveler. In cooler conditions, use indirect auxiliary heaters to maintain ambient and substrate temperatures within the required range. For temperatures above 85 degrees F, follow ACI hot-weather application guidelines to ensure a successful installation.
- D. Water to be clean, potable, and cool, not warmer than 70 degrees F.
- E. Conventional piston, rotor-stator or underlayment-type pumps may be used for application of self-leveling over large areas.

- F. Strictly follow manufacturer's mixing instructions for exact water cement ratios, mixing times, speed and type of mixing blade. Mix full unit quantities, if working from bulk containers, mixer must be able to accommodate entire unit of unmixed product. Self-leveler is a calcium aluminate quick setting, fast drying shrinkage compensated product when mixed correctly. Overwatering will cause shrinkage and potential delamination.
- G. Maintain continuous flow of wet material to avoid trapping air or creating a cold joint.
- H. Maintaining a wet edge throughout placement. Quickly pour or pump self-leveler onto properly prepared and primed surface in ribbon pattern.
- I. Spread self-leveler with gauge rake to desired depth. Break surface tension of material with smoother or needle roller to allow self-leveler to flow. Apply at 3/16 inch minimum thickness.
- J. Apply self-leveler to flatness of 1/8 inch in 10 feet.
- K. Verify with manufacturer regarding minimum time to install ceramic tile, or non-breathable floor coverings on self-leveler.

3.11 CLEANUP

- A. Use soap with water or use denatured alcohol to clean equipment before product cures to a hardened state. Cured product can only be removed mechanically.

3.12 PROTECTION

- A. Protect the surface of the cured MVE control system from traffic and damage until covered by floor finish. Protection may include plywood, or other suitable protection board.

END OF SECTION

SECTION 09-6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient sheet flooring.
- B. Resilient tile flooring.
- C. Resilient base.
- D. Installation accessories.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Describing physical and performance characteristics, sizes, patterns and colors available, compliance with this Section and installation instructions.
 - 2. Verification Samples: 6 inch minimum dimension, illustrating color and pattern for each resilient flooring product specified.
 - 3. Certification: Subfloor complies with moisture content requirements specified in the Examination section and manufacturer's instructions.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Extra Stock: As specified elsewhere within this section.
 - 2. Maintenance Data: Indicating maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning for each product.
 - 3. Warranty: Written warranty and supporting letter as specified elsewhere within this section.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of resilient product and accessory as produced by a single manufacturer per type with a minimum of ten years experience in type of products specified.
- B. Installer: Certified in writing by manufacturer as being qualified to install resilient product and with a minimum of three years successful experience in work specified.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect roll materials from damage by storing on end.
- B. Products shall be delivered to job site in original unopened packages bearing manufacturer's labels.
- C. Store and protect products in accordance with manufacturer's recommendations and Section 01-6000.
 - 1. Maintain temperature and humidity within ranges required by manufacturer's instructions.

1.05 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 65 degrees F.

1.06 EXTRA MATERIALS

- A. Provide extra resilient products in quantities indicated on Finish Drawings.

1.07 WARRANTY

- A. Manufacturer's standard limited commercial warranty for wear, staining, and fading commencing on date of substantial completion on flooring products. Warranty to be 5-year unless longer noted below.
 - 1. LVT: 10-year warranty.
 - 2. SVF: 15-year warranty.

PART 2 PRODUCTS

2.01 SHEET FLOORING

- A. Vinyl Sheet Flooring - Type SV: Homogeneous without backing, with color and pattern throughout full thickness.
 - 1. Manufacturer/ Pattern/ Color: As scheduled on Finish Drawings.
 - a. Substitutions: See Section 01-2513 Product Substitution Procedures.
 - 2. Minimum Requirements: Comply with ASTM F1913.
 - 3. Smoke Development: 450 or less (ASTM E662).
 - 4. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
 - 5. Thickness: 0.080 inch nominal.
 - 6. Sheet Width: 72 inch minimum.
 - 7. Thickness: 0.080 inch minimum.
 - 8. Static Load Resistance: 250 psi minimum, when tested as specified in ASTM F970.
 - 9. Seams: Heat welded.
 - 10. Integral coved base with metal cap strip.
- B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.02 TILE FLOORING

- A. Vinyl Composition Tile - Type VT: Homogeneous, with color extending throughout thickness.
 - 1. Manufacturer/ Pattern/ Color: As scheduled on Finish Drawings.
 - a. Substitutions: See Section 01-2513 Product Substitution Procedures.
 - 2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
 - 3. Smoke Development (ASTM E662): 450 or less

4. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
 5. Size: 12 by 12 inch.
 6. Thickness: 0.080 inch.
- B. Vinyl Tile - Type LVF: Printed film type, with transparent or translucent wear layer.
1. Manufacturer/ Pattern/ Color: As scheduled on Finish Drawings.
 2. Minimum Requirements: Comply with ASTM F1700, Class III, Type B, printed film tile, embossed surface.
 3. Smoke Development (ASTM E662): 450 or less
 4. Critical Radiant Flux (CRF): Class 1, Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
 5. Wear Layer Thickness: 0.020 inch.
 6. Total Thickness: 0.118 inch.

2.03 RESILIENT BASE

- A. Resilient Base - Type RB: ASTM F1861, Type TP, rubber, thermoplastic; Style B, Cove.
1. Manufacturer/ Color: As scheduled on Finish Drawings.
 2. Height: As scheduled on Finish Drawings.
 3. Thickness: 0.080 inch thick.
 4. Length: Roll.

2.04 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by resilient product manufacturer for application.
- C. Moldings, Transition and Edge Strips: Same material as flooring.
- D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- 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 resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Test as Follows:

- a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 2. Concrete surfaces shall be smooth and flat with maximum variation of 1/8 inch in 10 ft., and ready to receive flooring materials.
 3. Do not install flooring on concrete which has been sealed.
 4. If test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer, see Section 09-6100 for floor moisture mitigation.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.
- E. Beginning of installation means acceptance of substrate and site conditions.
- F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions for preparation, installation, cleaning and protection.
- C. Adhesive-Applied Installation:
 1. Spread only enough adhesive to permit installation of materials before initial set.
 2. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26-0526 for grounding and bonding to building grounding system.
 3. Fit joints and butt seams tightly.
 4. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 1. Resilient Strips: Attach to substrate using adhesive.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

- G. Install flooring in recessed floor access covers, maintaining floor pattern.
- H. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.04 INSTALLATION - SHEET FLOORING

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns carefully at seams. Avoid cross seams, filler pieces, and strips.
- B. Cut sheet at seams in accordance with manufacturer's instructions.
- C. Seal seams by heat welding where indicated.
- D. Spread only enough adhesive to permit installation of sheet flooring before initial set.
- E. Extend flooring into door recesses, closets, and similar openings as indicated on drawings.
- F. Scribe, cut, and fit to walls, columns, cabinets, pipes, built-in-furniture and cabinets to produce tight joints.
- G. Set sheet flooring in place, press with heavy roller to attain full adhesion
- H. Coved Base: Install using coved base filler as backing at floor to wall junction as indicated on Drawings. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.
- I. Seams: See Product for type.
 - 1. Heat-Welded Seams: Rout joints and heat weld with welding bead, permanently fusing Sections into a seamless floor covering. Prepare, weld, and finish seams according to manufacturer's written instructions and ASTM F1516 to product surfaces flush with adjoining floor covering surfaces.

3.05 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Spread only enough adhesive to permit installation of resilient tile before initial set.
- C. Set floor tiles in place, press with heavy roller to attain full adhesion.
- D. Lay tiles to the pattern indicted on Finish Drawings.
- E. Install square tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.
- F. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.06 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.

- C. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where wall base is required.
- D. Install base on solid backing. Bond tightly with continuous contact to wall and floor surfaces.
- E. Scribe and fit to door frames and other interruptions.

3.07 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions, including finishing with an auto scrubber per manufacturer's instructions..

3.08 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation and heavy traffic or furniture installation for 72 hours.
- B. Floor protection recommended by the flooring manufacturer shall be provided and shall remain on the floor until all move-in activities are complete and no additional deliveries are expected by the Owner or Contractor.
- C. Any damage to the floor prior to building turnover is the responsibility of the Contractor to replace.

END OF SECTION

SECTION 09-6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Indicating all technical information which specifies full compliance with requirements of this Section, including installation instructions for carpet and accessories.
 - 2. Shop Drawings: Showing carpet layout indicating carpet direction, and types of edge strips. Indicate locations where cutouts are required in carpet. Show details at special conditions.
 - 3. Samples/Carpet: 12" x 12" minimum size illustrating colors and patterns for each type of carpet specified.
 - 4. Samples/Edge Strips: 6" long pieces of each type specified.
 - 5. Laboratory Test Reports: Required from and certified by carpet manufacturer indicating the carpet specified is manufactured to meet or exceed the required fire rating for code compliance.
 - 6. Certification: Subfloor complies with moisture content requirements specified in the Examination section and manufacturer's instructions.
 - 7. Manufacturer's Certification indicating compliance with ADA Accessibility Guidelines 4.5.3 and applicable Accessibility Code for carpet pile thickness.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals
 - 1. Maintenance Data: From carpet manufacturer, describing maintenance procedures, recommended maintenance materials and suggested cleaning schedule.
 - 2. Warranty: As specified elsewhere in this Section.
 - 3. Extra Stock: As specified elsewhere within this section.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.
- C. Carpet Surface Burning Characteristics: Provide carpet identical to that tested by DOC FF-1-70 and by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify carpet with appropriate markings of applicable testing and inspecting organization.

1.04 DELIVERY HANDLING, STORAGE

- A. Products shall be delivered to job site in original unopened packages bearing manufacturer's labels.
- B. Store and protect products in accordance with manufacturer's recommendations and Section 01-6000.
 - 1. Maintain temperature and humidity within ranges required by manufacturer's instructions.

1.05 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 72 hours prior to installation.

1.06 EXTRA MATERIALS

- A. Provide extra carpet products in quantities indicated on Finish Drawings.

1.07 WARRANTY

- A. Warranty: Manufacturer to provide a 10 year performance and 10 year tuft bind warranty.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Tile Carpeting: Fusion bonded, manufactured in one color dye lot.
 - 1. Manufacturer, Gauge, Weight, Size Color: As indicated for product on Finish Drawings.
 - 2. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 3. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 - 4. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.02 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Rubber, color as noted on Finish Drawings.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet 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 carpet tile.

- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Moisture Vapor Emission: ASTM F1869.
 - 2. If test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer, see Section 09-6100 for floor moisture mitigation.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction alternating to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Extend carpet under open-bottomed obstructions and removable furnishings.
- I. Extend carpet into alcoves and closets of each space unless indicated otherwise.
- J. Trim carpet tile neatly at walls and around interruptions.
- K. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09-8100
ACOUSTIC INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass fiber sound-attenuation blankets for walls.

1.02 QUALITY ASSURANCE

- A. Manufacturer: A firm with not less than five years of successful experience in producing sound attenuation blankets similar to that specified.
- B. Installer for Fire Blankets: A firm with at least three years of experience with installation of sound attenuation fire blankets.

1.03 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Indicating full compliance with requirements of this Section.

1.04 DELIVERY, HANDLING, STORAGE

- A. Insulation shall be delivered in original unopened packages bearing manufacturer's labels in accordance with Section 01-6000.
- B. Store and protect materials in accordance with manufacturer's recommendations and Section 01-6000.
 - 1. Store in a clean and dry place; protect against moisture.

PART 2 PRODUCTS

2.01 SOUND-ATTENUATION BLANKETS

- A. Type: Unfaced, sound attenuation insulation, complying with property requirements of ASTM C518; ASTM E84, NFPA 220.
 - 1. Thickness: 3-1/2 inch
 - 2. STC Rating; ASTM E90: 44 minimum
 - 3. Product:
 - a. Owens-Corning; Sound Attenuation Batt Insulation: www.owenscorning.com
 - b. Substitutions: See Section 01-2513 Product Substitution Procedures.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Install in accordance with manufacturer's published recommendations and without visible gaps or segregation.
 - 2. Refer to drawings for locations of installation.
- B. In Walls:

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1. Do not install sound-attenuation blankets before mechanical and electrical work is complete.
2. "Friction-fit" blankets between studs until wall cavities are completely filled, and without gaps and voids.
3. Fit blankets tightly to mechanical and electrical items within the area of blankets.
4. Pack insulation around door frames, in cracks, and other voids.
5. Where insulation must extend higher than 8 feet, secure insulation in place with wire strands with first wire placed horizontally at 8 feet above floor, then spaced horizontally 2 feet apart. Stretch tie wire strands at every fourth stud. Longer runs which are not tied at every fourth stud are not acceptable.

3.02 PROTECTION

- A. Protect the installed sound-attenuation blankets from physical abuse and the weather.
- B. Blankets which are damaged or becomes wet after installation shall be replaced with new blankets.

END OF SECTION

SECTION 09-9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Behind Movable Equipment & Furniture:
 - a. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
 - b. Paint surfaces behind permanently-fixed equipment or furniture with only a prime coat before final installation of equipment.
 - 2. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
 - 3. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
- 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 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Manufacturer's Product Data: Clearly indicating technical information including paint label analysis and application instructions for each material proposed for use.
 - 2. Color Samples: Submit samples of each color noted.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals.
 - 1. Extra Materials: As specified elsewhere within this section.

2. Maintenance Manual: Manufacturer's product data sheets, material safety data sheets, care and cleaning instructions, touch-up procedures and area summary for where paints were used.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.05 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.06 EXTRA STOCK

- A. Paint:
 1. Provide a minimum of 1 gallon container of each color and type of paint to Owner.
 2. Label each container with color, texture, room locations, and color mix, in addition to the manufacturer's label.

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. For purpose of designating type and quality of paint required, systems for the following manufacturers are specified:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com.
 - 2. PPG Architectural Finishes, Inc: www.ppgpaints.com.
- C. Substitutions: The following manufacturers are acceptable only after compliance with requirements of this Section:
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. Other manufacturers are acceptable for evaluation only after compliance with substitution requirements specified in See Section 01-2513 Product Substitution Procedures

2.02 PAINTS AND COATINGS - GENERAL

- A. Systems specified establish the minimum number of primer and finish coats acceptable.
- B. 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. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- C. 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.
- D. 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.
- E. Colors: As indicated on drawings
 - 1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2. Piping and Conduit: Comply with current ANSI and applicable governing codes. Coordinate with Mechanical and Electrical Work in Divisions 22-28.

2.03 EXTERIOR PAINT SYSTEMS

- A. Non-Ferrous Metal (Aluminum, Galvanized):
 1. Sherwin Williams System
 - a. 1st Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, BB66-1100 Series
 - b. 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66-1100 Series (6.0-10.0 mils wet, 2.0-4.0 mils dry per coat)
 2. PPG System
 - a. 1st Coat: PPG 7-374 Series Int/Ext Acrylic Semi-Gloss Metal Finish
 - b. 2nd Coat: PPG 7-374 Series Int/Ext Acrylic Semi-Gloss Metal Finish (4 mils wet, 1.5 to 2.0 mils dry per coat)

2.04 INTERIOR PAINT SYSTEMS

- A. Gypsum Board - Epoxy (Pre-catalyzed):
 1. Use for all epoxy unless noted otherwise.
 2. Sherwin Williams System
 - a. Gypsum Board Primer: High Build Drywall Surfacer. See Section 09-2116.
 - b. First Coat: Pro Industrial PreCatalyzed Waterbased Epoxy, Semi-Gloss, K46-151 Series
 - c. Second Coat: Pro Industrial PreCatalyzed Waterbased Epoxy, Semi-Gloss, K46-151 Series
 3. PPG System
 - a. Gypsum Board Primer: High Build Drywall Surfacer. See Section 09-2116.
 - b. First Coat: PPG 16-510 Series Pitt Glaze WB1 Precatalyzed Semi-Gloss Acrylic Epoxy
 - c. Second Coat: PPG 16-510 Series Pitt Glaze WB1 Precatalyzed Semi-Gloss Acrylic Epoxy
- B. Gypsum Wallboard Painted - Satin:
 1. Sherwin Williams System
 - a. Gypsum Board Primer: High Build Drywall Surfacer. See Section 09-2116.
 - b. First Coat: S-W ProMar 200 Zero VOC Interior Latex Eg-shel, B20W2651
 - c. Second Coat: S-W ProMar 200 Zero VOC Interior Latex Eg-shel, B20W2651(4 mils wet, 1.6 mils dry per coat)
 2. PPG System
 - a. Gypsum Board Primer: High Build Drywall Surfacer. See Section 09-2116.
 - b. First Coat: PPG 6-4310XI Speedhide Latex Eggshell Enamel
 - c. Second Coat: PPG 6-4310XI Speedhide Latex Eggshell Enamel (4 mils wet, 1.5 mils dry per coat)
- C. Ferrous Metal (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron, Structural Iron):
 1. Sherwin Williams System
 - a. First Coat: S-W Pro Industrial Pro-Cryl Primer, B66-310 (2-4 mils dry.)
 - b. Second Coat: Pro Industrial DTM Industrial Enamel Semi-Gloss, B66W1151

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- c. Third Coat: Pro Industrial DTM Industrial Enamel Semi-Gloss, B66W1151 (4 mils wet, 1.3 mils dry per coat).
2. PPG System
 - a. First Coat: PPG 90-912 Pitt Tech Plus Int/Ext Acrylic DTM Industrial Primer (2-4 mils DFT)
 - b. Second Coat: PPG 90-1210 Series Pitt Tech Plus 100% Acrylic Int/Ext Semi Gloss DTM Enamel
 - c. Third Coat: PPG 90-1210 Series Pitt Tech Plus 100% Acrylic Int/Ext Semi Gloss DTM Enamel (4 mils wet, 1.4 mils dry per coat)
- D. Insulated Pipe:
 1. Sherwin Williams System
 - a. First Coat: ProMar 400 Zero VOC Interior Latex Semi-gloss, B31W04651 Series
 - b. Second Coat: ProMar 400 Zero VOC Interior Latex Semi-gloss, B31W04651 Series
 2. PPG System
 - a. First Coat: PPG 12-510 Series Speedhide Pro EV Interior Latex Semi-Gloss.
 - b. Second Coat: PPG 12-510 Series Speedhide Pro EV Interior Latex Semi-Gloss.
- E. Concrete - Floors:
 1. Sherwin Williams System
 - a. Two Component Water Based Epoxy - ArmorSeal Floor-Plex 8100, Satin, B70W8161 Series with SharkGrip additive for slip resistance.
 2. PPG System
 - a. Two Component Water Based Epoxy - SFT610 Series PPG Anti-Slip Safety Flooring Systems

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.

- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 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. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- G. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.
- H. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- I. Galvanized Surfaces to be Painted: Prepare surface per ASTM D6386. Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- J. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- L. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's instructions.

- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. All painting work shall be completed before carpet work is started.
- E. All walls shall be painted prior to installing ceiling grid/wall molding.
- F. Epoxy: On walls scheduled to receive vinyl or rubber base, epoxy shall extend not more than 1/2" below top of base.
- G. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- H. Apply each coat to uniform appearance.
- I. The number of coats specified herein for various finishes is customarily sufficient to obtain satisfactory finish, but should such finish not be obtained, it shall be responsibility of Contractor to apply additional coats as may be required.
- J. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- K. Built-in Items: Paint expansion joints, grilles, and fire extinguisher cabinets occurring in gypsum wallboard to match color and texture of wall.
- L. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- M. Do not paint low voltage or telecommunications cabling. Contractor shall be responsible for any warranty issues arising from paint on cabling.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. During progress of painting work:
 - 1. Remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
 - 2. Maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.
 - 3. Remove paint where spilled, splashed, or splattered.

3.05 PROTECTION

- A. Protect finished coatings until completion of project.

END OF SECTION

SECTION 10-2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.
- B. Protective wall covering.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Product Data: Clearly indicating technical information about each product specified including compliance with the local accessibility code.
 - 2. Shop Drawings: Clearly indicate the following for each type of wall protector:
 - a. Type of wall protector identified by manufacturer's model numbers including profiles, sizes, accessories and finish.
 - b. Types and sizes of wall anchors for each type of wall construction.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 2. Inpro: www.inprocorp.com/#sle.
 - 3. Koroseal Interior Products: www.koroseal.com/#sle.
 - 4. Substitutions: See Section 01-2513 Product Substitution Procedures.
- B. Protective Wall Covering:
 - 1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 2. Inpro: www.inprocorp.com/#sle.
 - 3. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.02 PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.
- C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.
- D. Accessibility: Each type of wall protector to be compliant with the applicable Accessibility Code.

2.03 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
 - 1. Material: High impact vinyl with full height extruded aluminum retainer.
 - 2. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
 - 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 4. Width of Wings: 3 inches.
 - 5. Corner: Radiused.
 - 6. Color: As indicated on drawings.
 - 7. Length: One piece.
 - 8. Preformed end caps.
- B. Protective Wall Covering, Type WP1:
 - 1. Material: High-impact acrylic-modified vinyl.
 - 2. Thickness: 0.040 inch.
 - 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 4. Color: As indicated on drawings.
 - 5. Accessories: Provide manufacturer's standard color-matched trim and moldings.
 - 6. Mounting: Adhesive.
- C. Adhesives and Primers: As recommended by manufacturer.
- D. Accessories: Each type of wall protector shall be complete with all accessories and attachments required to complete the assemblies including the following:
 - 1. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.
 - 2. Wall anchors in contact with pressure treated wood shall be of stainless steel.
 - 3. See Section 06-1000 for wood blocking for wall and corner guard anchors.

2.04 FABRICATION

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that substrate surfaces for adhered items are clean and smooth.
- C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard to extend from base to ceiling.
- C. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.
 - 1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
 - 2. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
 - 3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
 - 4. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
 - 5. Use a roller to ensure maximum contact with adhesive.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10-2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Diaper changing stations.
- C. Utility room accessories.

1.02 QUALITY ASSURANCE

- A. Manufacturer: Toilet accessories shall be manufactured by a firm with a minimum 10 years experience in producing product similar to that indicated for this project.
- B. For the purpose of designating the minimum aesthetic, functional, and quality standards for the work of this Section, proprietary products are specified.
- C. Toilet accessories shall comply with the most current regulations of the local accessibility code.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.04 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Schedule and product data for each type accessory required. Include compliance with accessibility regulations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. Basis of Design: Bradley Corporation: www.bradleycorp.com., unless noted otherwise.
 - 2. Other Acceptable Manufacturers:
 - a. ASI - American Specialties, Inc: www.americanspecialties.com.
 - b. Bobrick Washroom Equipment: www.bobrick.com
 - 3. Substitutions: See Section 01-2513 Product Substitution Procedures.
- B. Diaper Changing Stations and Accessories:
 - 1. American Specialties, Inc: www.americanspecialties.com.
 - 2. Bradley Corporation: www.bradleycorp.com.
 - 3. Koala Kare Products: www.koalabear.com.
 - 4. Rubbermaid: www.rubbermaidcommercial.com.
 - 5. Substitutions: See Section 01-2513 Product Substitution Procedures.
- C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

- A. General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Keys: Provide 2 keys for each accessory to Owner.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- F. Adhesive: Two component epoxy type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. OWNER PROVIDED CONTRACTOR INSTALLED
 - 1. Toilet tissue dispensers
 - 2. Soap dispensers
 - 3. Paper towel dispensers
 - 4. Locations: As indicated on Drawings.
- B. Mirror: Stainless steel, 3/4" x 3/4" channel, wall-mounted
 - 1. Size: Refer to Drawings.
 - 2. Mirror: No. 1 quality, 1/4" float/plate glass, thermosetting infrared cured paint backing with Poly-Glaze protective finish. Manufactured in accordance with ASTM C 1036 and ASTM C 1503, guaranteed for 15 years against spoilage.
 - 3. Edges and back of mirror shall be protected by full-size shock-absorbing, waterproof, neoprene tubing.
 - 4. Product: 781 Series manufactured by Bradley Corporation.
- C. Grab Bars: Stainless steel, peened surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Length and Configuration: As indicated on drawings.

TOILET, BATH, AND LAUNDRY ACCESSORIES 10-2800 - 3

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- d. Product: 812 Series manufactured by Bradley Corporation.
- D. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
 - 1. Product: 9114 manufactured by Bradley Corporation.

2.05 DIAPER CHANGING STATIONS AND ACCESSORIES

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Polyethylene.
 - 2. Style: Horizontal.
 - 3. Mounting: Surface.
 - 4. Color: To be selected from manufacturer's offerings.
 - 5. Minimum Rated Load: 250 pounds.

2.06 UTILITY ROOM ACCESSORIES

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.
- D. See Section 06-1000 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

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.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10-4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguisher cabinets.
- B. Lock Box

1.02 QUALITY ASSURANCE

- A. Provide portable fire extinguishers, cabinets and accessories by same manufacturer.
- B. Provide new portable fire extinguishers which are U.L. listed and bear U.L. "Listing Mark" for type, rating and classification of extinguisher indicated.
- C. Comply with local accessibility requirements.

1.03 SUBMITTALS

- A. Follow section 01-3323 for making construction submittals.
 - 1. Submit product data, maintenance data, and installation details for each type of items specified and required.

1.04 DELIVERY, HANDLING AND STORAGE

- A. Products shall be delivered to job-site in original unopened packages bearing manufacturer's labels in accordance with Section 01-6000.
- B. Store and protect products in accordance with manufacturer's recommendations and Section 01-6000.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com
 - 3. Potter-Roemer: www.potterroemer.com
 - 4. Substitutions: See Section 01-2513 Product Substitution Procedures.
- B. Lock Box:
 - 1. Box as required to meet local requirements, if there are no requirements, the following are acceptable:
 - 2. United Technologies; SupraSafe Key Box: www.suprasystems.com.
 - 3. Knox Company; Knox-Box Rapid Entry System: www.knoxbox.com.
 - 4. The Keyless Lock Store; Bigger Combination Lock Box: www.nokey.com.
 - 5. Substitutions: See Section 01-2513 Product Substitution Procedures

2.02 FIRE EXTINGUISHERS

- A. Owner provided.

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire Extinguisher Cabinet for 10 lb ABC Type FEC
 1. Box and Door Metal: Formed primed steel sheet; 0.1046 inch thick base metal.
 2. Cabinet Configuration: Semi-recessed type.
 - a. Sized to accommodate accessories and fire extinguisher.
 - b. Trim: Returned to wall surface, rounded edge with 3 inch projection.
 - c. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
 3. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with lock and breakable window access. Hinge doors for 180 degree opening with continuous piano hinge.
 4. Door Glazing, Full: Plastic, clear, 1/8 inch thick acrylic. Set in resilient channel gasket glazing.
 5. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
 6. Fabrication: Weld, fill, and grind components smooth.
 7. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish.
 8. Finish of Cabinet Interior: White colored enamel.
 9. Decal Lettering: Vertical Red
- B. Refer to detail on Contract Drawings.

2.04 LOCK BOX

- A. To comply with local ordinance requirements, provide exterior lock boxes for emergency rapid entry.
 1. Notify Fire Department as soon as lock box installation is completed.
 2. Label all keys properly.
- B. Acceptable Manufacturers:
 1. Supra-Safe Key Box
 2. "Knox-Box Rapid Entry System," The Knox Company, Newport Beach, CA.
 3. "Bigger Combination Lock Box," The Keyless Lock Store, East Hills, NY.
 4. Substitutions: See Section 01-2513 Product Substitution Procedures
- C. Location: As required by authority having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Seal air and water barrier around any penetrations in exterior sheathing.

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- C. Secure rigidly in place.
- D. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 10-5100
LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal lockers.

1.02 SUBMITTALS

- A. Follow section 01-3323 for making construction submittals.
 - 1. Shop Drawings: Indicate locker plan layout, numbering plan and elevations of groups of lockers, locker types, locker size, installation details, accessories, color and finish.
 - 2. Product Data: Describing locker construction, materials, components.
 - 3. Samples: For color selections.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals.
 - 1. Warranty: As specified elsewhere within this section.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver lockers to jobsite until building conditions are adequate to receive this locker work.
- B. Protect locker finish and adjacent surfaces from damage.

1.04 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of wood lockers that fail in materials or workmanship, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period: Three years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Lockers:
 - 1. Lyon Workspace Products: www.lyonworkspace.com.
 - 2. Penco Products, Inc: www.pencoproducts.com.
 - 3. Republic Storage Systems Co: www.republicstorage.com.
 - 4. Substitutions: See Section 01-2513 Product Substitution Procedures.

2.02 LOCKER APPLICATIONS

- A. Double Tier: Two tier metal lockers, free-standing with matching closed base.
 - 1. Width: 12 inches.

2. Depth: 15 inches.
3. Height: 72 inches.
4. Fittings: Hat shelf, 2 coat hooks.
5. Locking: Padlock hasps, for padlocks provided by Owner.

2.03 METAL LOCKERS

- A. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
 1. Where ends or sides are exposed, provide flush panel closures.
 2. Color: To be selected by Architect.
- B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
 1. Body and Shelves: 24 gage, 0.0239 inch.
 2. Base: 20 gage, 0.036 inch.
 3. Metal Base Height: 4 inch.
- C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
 1. Door Frame: 16 gage, 0.0598 inch, minimum.
- D. Doors: Hollow double pan, sandwich construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
 1. Door Outer Face: 16 gage, 0.0598 inch, minimum.
 2. Door Inner Face: 20 gage, 0.0359 inch, minimum.
 3. Form recess for operating handle and locking device.
 4. Provide louvers in door face, top and bottom, for ventilation.
- E. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.
 1. Hinge Thickness: 14 gage, 0.0747 inch.
- F. Trim: 20 gage, 0.0359 inch.
- G. Coat Hooks: Stainless steel or zinc-plated steel.
- H. Number Plates: Provide oval shaped brass plates. Form numbers 1 inch high of block font style with ADA designation, in contrasting color.
- I. Locks: Locker manufacturer's standard type of style indicated above.
- J. Locking device supplied by Owner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.

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- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops to completely close off openings.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

END OF SECTION

SECTION 10-7316
PROTECTIVE COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pre-engineered, factory-assembled, aluminum entrance cover system canopy and column supported walkway.

1.02 QUALITY ASSURANCE

- A. Canopy and Walkway shall be manufactured and furnished as a complete system by one firm able to demonstrate a minimum of five years successful experience in work of this nature.
- B. Erection shall be performed by the manufacturer's approved installer.

1.03 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Shop Drawings Clearly Indicating:
 - a. Necessary plan dimensions, elevations and details.
 - b. Installation and connection details.
 - c. Materials and finishes.
 - 2. Manufacturer's Product Data: Include product information, specifications and installation instructions for building components and accessories.
 - 3. Certification: Submit design calculations stamped and signed by a Registered Professional Engineer in the State in which the Project is located. Design calculations shall state that the protective cover system design complies with the wind requirements of ASCE 7-95, Minimum Design Loads for Buildings and other Structures, latest edition, the stability criteria of applicable building code, and all other governing criteria.

1.04 DELIVERY, HANDLING, STORAGE

- A. Products shall be delivered to job-site in original unopened packages bearing manufacturer's labels in accordance with Section 01-6000.
- B. Store and protect products in accordance with manufacturer's recommendations and Section 01-6000.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Provide products manufactured by Peachtree Protective Covers, www.peachtreecovers.com
 - 1. Substitutions: Products by the following manufacturers and other manufacturers are acceptable if they meet the requirements of this section.
 - a. Dittmer Architectural Aluminum www.dittdeck.com
 - b. E.L. Burns www.elburns.com

- c. Mapes Industries, www.mapes.com
- d. For substitution requests follow Section 01-2513 Product Substitution Procedures.

2.02 MATERIALS

- A. Structural members and deck materials shall be extruded aluminum alloy 6063, heat treated to T6 temper per ASTM B221.
- B. Aluminum Castings: ASTM B 26, alloy 319.
- C. Hanger Rods and attachments: Galvanized steel.
- D. Fasteners: All aluminum, 18-8 stainless steel or 300 series stainless steel.
- E. Grout: Grout shall be 2000 psi compressive strength.
- F. Gaskets: Shall be dry seal santaprene pressure type.
- G. Flashing: Aluminum, ASTM B 209, Type 3003 H14, 0.040 inch thick minimum.
- H. Finish:
 - 1. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
 - a. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as indicated on drawings.
 - 2. Color: As selected by Architect from manufacturers premium options.

2.03 CANOPY

- A. Flat, hanger rod suspended, stock canopy with flat soffit of all aluminum construction with concealed drainage system.
 - 1. Deck: 300-600 Series.
 - 2. Canopy Fascia/ Gutter: 6 inch.

2.04 COLUMN SUPPORTED WALKWAY COVER

- A. Flat stock canopy and columns with flat soffit of all aluminum construction with concealed drainage system.
 - 1. Deck: 300-600 Series
 - 2. Fascia/ Gutter: 8 inch
 - 3. Columns: 6 inch by 6 inch aluminum columns.

2.05 FABRICATION

- A. General:
 - 1. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.
 - a. Welding: In accordance with ANSI/AWS D1.2 and D1.3.

2. Bent Construction: Factory assemble beams to columns to form one-piece rigid bents. Where used make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints can be used if supported by engineering calculations and/or testing.
- B. Columns: Provide radius-cornered tubular extrusions with cutout and internal diverter for drainage where indicated. Circular downspout opening in column not acceptable.
- C. Beams: Provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner.
- D. Deck:
1. Fabricate from extruded modules that interlock in a self-flashing manner.
 2. Provide welded plate closures at deck ends.
 3. Positively fasten interlocking joints creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each.
 4. Assemble deck with sufficient camber to offset dead load deflection.
 5. Roll formed deck is not acceptable.
 6. Deck and columns to have internal drainage.
- E. Gutter Fascia:
1. Factory assemble gutter fascia frames to form a one-piece welded frame.
 2. Make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted.
 3. Gutter frames constructed by mechanically fastening components together are not acceptable.
- F. Fascia: Provide fascia splices where continuous runs of fascia are jointed. Locate splices to be in line with bents and fasten in place on hidden or non-vertical surfaces.
- G. Hanger Assemblies: Provide extruded aluminum hanger rods in manufacturer's standard shapes and sized to meet the loads seen by canopy.
- H. Expansion joints shall be included to accommodate temperature changes of 120 degrees Fahrenheit. Expansion joints shall have no metal to metal contacts.
- I. Canopy and Walkway system shall be designed for extreme windloading in accordance with governing codes indicated on Index Sheet of Drawings, 100 year means recurrence interval.

PART 3 EXECUTION

3.01 COORDINATION

- A. Verify field dimensions.

- B. Verify that all concrete, masonry and roofing work is completed in the immediate area.

3.02 INSTALLATION

- A. Install canopy and walkway in accordance with approved shop drawings and manufacturer's instructions.
- B. Conceal anchorages where possible.
- C. Carefully align vertical and horizontal members to be plumb and level.
- D. Apply clear acrylic protective coating to surfaces which will be in contact with cementitious materials. Use care to keep coating away from exposed surfaces.
- E. Fill downspout columns with grout to the discharge level to prevent standing water. Install weep holes at the top of concrete in non-draining columns to remove condensation.
- F. Provide hairline miters and fitted joints.

END OF SECTION

SECTION 21-0500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements of Division 01 Specifications, General Provisions of the Contract and General and Supplementary Conditions apply to this Division.

1.02 REGULATORY REQUIREMENTS

- A. Perform work specified in Division 21, in accordance with the codes and standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect.
 - 1. NFPA 13: Standard for the Installation of Sprinkler System
 - 2. NFPA 14: Standard for the Installation of Standpipe and Hose Systems.
 - 3. NFPA 99: Healthcare Facilities Code.
 - 4. NFPA 101: Life Safety Code.
 - 5. ANSI Handicapped Code-A117.1
 - 6. U.L Fire Resistance Index
 - 7. ASTM E814-08B: Standard Test Method for Fire Tests of Penetration Firestop Systems.
 - 8. IBC: International Building Code, with Mechanical and Plumbing Codes.
 - 9. NFPA 10: Standard for Portable Fire Extinguishers
 - 10. NFPA 70: National Electrical Code
 - 11. NFPA 72: National Fire Alarm and Signaling Code
 - 12. NFPA 241: Standard for Safeguarding Building Construction, Alteration and Demolition Operations
 - 13. FGI Guidelines for Design and Construction of Health Care Facilities
 - 14. Special regulations, supplement, and amendments of the State and/or local authorities having jurisdiction.

1.03 REFERENCE STANDARDS

- A. ANSI: American National Standards Institute.
- B. ASME: American Society for Mechanical Engineers.
- C. ASTM: American Society for Testing and Materials.
- D. AWWA: American Water Works Association.
- E. FM: Factory Mutual
- F. IRI: Industrial Risk Insurers
- G. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry.
- H. NEMA: National Electrical Manufacturers' Association.
- I. NFPA: National Fire Protection Association.
- J. U.L.: Underwriters' Laboratories, Inc.
- K. U. L. Fire Resistance Index.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with requirements of Division 01 including the required number of copies.
- B. Include Products as specified in the individual sections of Division 21.
- C. Submit shop drawing and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- D. Prepare shop drawings completely independent of the Engineer of Record's CADD files. Should the Contractor or Vendor wish to use the Engineer of Record's CADD files or model as the basis for developing their shop drawings, a release form, obtainable from the Engineer or Architect, must be signed.
- E. Submit copies of shop drawings in accordance with Division 01, including:
 - 1. Concrete pads and foundations including anchor bolt and sleeve locations
 - 2. Fire protection systems and hydraulic calculations.
 - 3. Prepare and submit coordination drawings specified herein. Facilitate the coordination effort with other trades, specifically Divisions 22, 23, 26 and 28.
- F. Brochures: Submit manufacturer's product data and brochures including:
 - 1. Complete descriptions.

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2. Illustrations and wiring diagrams.
3. Rating data, accessories, dimensional data, and applicable options and features marked for the specific items scheduled on drawings and specified herein.
4. Capacities stated in the terms specified and scheduled.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Division with a minimum of 5 years of documented experience.
- B. Comply with all codes and standards adopted by the authorities having jurisdiction.
- C. Perform all required tests of systems, record results and deliver as part of the project closing file.

1.06 FIELD CONDITIONS

- A. Layouts indicated on drawings are diagrammatical and intended to show relative positions and arrangement of piping and equipment. Coordinate work with other trades and with measurements obtained at the job site, as applicable, prior to installation. Generally, install work in locations shown on Drawings. Provide necessary rises, drops, and offsets to fit in the available space unless prevented by Project conditions.
- B. If prevented by project conditions, prepare drawings showing proposed rearrangement of The Work, including changes to Work specified in other sections. Obtain permission of the Architect before proceeding.
- C. Place anchors, sleeves, and supports prior to pouring concrete or installation of masonry work.
- D. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption in advance with Owner and all affected trades.
- E. Determine sizes and verify locations of existing utilities on or near site.
- F. Keep roads clear of materials and debris.
- G. Visit site and be informed of conditions under which Work must be performed.
- H. Locate equipment requiring periodic servicing so that it is readily accessible. Provide means of service access, following appropriate manufacturer's recommended service clearance space or, as applicable, means of access using wall or ceiling access doors.

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- I. Install piping to leave sufficient space for AHJ inspection of rated wall construction. Coordinate pipe routing with other trades including but not limited to the work of Divisions 22, 23, 26 and 28.

1.07 FEES AND PERMITS

- A. Obtain and pay for all necessary permits and inspection fees required to perform Division 21 work.

1.08 COORDINATION DRAWINGS

- A. Prior to commencement of installation, prepare coordination drawings for work under this Division, as specified in Division 01. Fully cooperate with persons coordinating and performing work under other Divisions.
- B. Drawings shall not be formally submitted but shall be kept on site for reference. Notify the Architect of conflicts that cannot be resolved.

1.09 COMPLETENESS OF WORK

- A. The Contract Documents depict fire suppression systems which are intended to be complete and functioning systems. All products, materials, and labor necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the Contractor.
- B. Catalog numbers referenced throughout the Division 21 Drawings and Specifications are intended to convey a general understanding of the type and quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra shall be allowed because a catalog number is found to be incomplete or obsolete.

1.10 PRODUCT SUBSTITUTIONS

- A. Comply with provisions of Division 01.

1.11 RECORD DRAWINGS

- A. Provide record drawings that illustrate the work of Division 21 as finally constructed. Deliver record drawings to the Architect in a form suitable for reproduction. Comply with the provisions and requirements of Division 01.
- B. Record drawings shall reflect all changes made to the Contract Documents, whether generated by addenda, change orders, or field conditions. Maintain a daily record of these changes and keep current set of drawings showing these changes.
- C. Deliver record drawings in a form suitable for re-production to the Architect within 30 days of Substantial Completion.

1.12 OWNING AND OPERATING MANUALS

- A. Comply with the requirements of Division 01, but provide a minimum of three sets.
- B. Manuals shall include clear and comprehensive instructions with appropriate graphics and project specific marked data to enable owner to operate and maintain all systems specified in this Division.
- C. Copies of reviewed submittals on furnished equipment shall be included.

PART 2 - PRODUCTS

2.01 EQUIPMENT SUPPORTS

- A. Structural steel for supports: ASTM A36.
 - 1. Use galvanized members installed areas of high humidity or condensation, and outside.
 - 2. Furnish other members with shop coat of red primer.
 - 3. Retouch primer after field welding.

2.02 FLASHINGS AND COUNTERFLASHINGS

- A. Furnish materials and coordinate installation for flashing and counterflashing roof penetrations for pipe and drains.
- B. Materials:
 - 1. Sheetmetal: 24 gauge minimum ASTM A525, Class G90
 - 2. Sheet lead: 3 pounds per square foot
 - 3. Stainless steel: Minimum 20 gauge
 - 4. Sheet copper: 24 OZ/SF

2.03 WALL AND CEILING ACCESS PANELS

- A. Style and type as required for material in which installed.
- B. Size: 24"x24" minimum, as indicated, or as required to allow inspection, service and removal of items served.
- C. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.

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- D. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.
- E. Prime painted or rust inhibitive paint finish.
- F. UL labeled when in fire-rated construction, 1-1/2 hour rating.
- G. 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 valves, and equipment needing periodic or replacement maintenance.
- H. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.
- I. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers.
 - 1. For masonry and drywall construction: Milcor Style M
 - 2. For plastered masonry walls and ceiling: Milcor Style K
 - 3. For ceramic tile or glazed structural tile: Use stainless steel panels

2.04 SLEEVES

- A. Materials
 - 1. Concrete floors, concrete and masonry walls: 18-gauge galvanized steel tube with welded longitudinal seam.
 - 2. Drywall partitions: 18 gauge galvanized steel sheet metal.
- B. Sleeves shall be sized such that the annular space between outside surface of pipe or pipe insulation and the inside surface of the sleeve is not less than 1/2". Provide larger annular space if required by firestopping product installation instructions.
- C. Sleeves supporting riser piping 4" and larger shall have three 6" long reinforcing rods welded radially at 120 degree spacing to the sleeve and shall be installed with the rods embedded in the concrete slab as the floor slabs are poured.
- D. Exterior wall and floor penetrations shall be sleeved and sealed with a Link Seal Modular Seal by GPT Industries or Flexicraft Industries.
 - 1. Exterior wall and floor penetrations: Install Link Seal Modular Seal by GPT or Flexicraft Industries. Seal shall be suitable for use in direct ground contact, water or atmospheric conditions with EPDM seal element. Provide Nitrile rubber seal element where subject to oils and fuel. All bolts, nuts and fasteners shall be Steel with 2-part Dichromate corrosion inhibiting coating or Type 316 Stainless steel.

2.05 ESCUTCHEON PLATES

- A. Provide B & C No. 10 or equal chrome plated escutcheon plates where pipes penetrate partitions or ceilings in finished spaces or areas.

END OF SECTION

VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT 21-0548 -1

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SECTION 21-0548

VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Seismic control requirements.
 - 1. Includes requirements for seismic qualification of equipment not specified in this section.
- C. Vibration isolators.
- D. External seismic snubber assemblies.
- E. Seismic restraint systems

1.02 RELATED REQUIREMENTS

- A. Section 01-4533 - Code-Required Special Inspections and Procedures.

1.03 DEFINITIONS

- A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.
- C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

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- F. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- H. FM 1950 - Seismic Sway Braces for Pipe, Tubing, and Conduit; Current Edition, Including All Revisions.
- I. MFMA-4 - Metal Framing Standards Publication; 2004.
- J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.
- K. UL 203A - Standard for Sway Brace Devices for Sprinkler System Piping; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Seismic Controls:
 - a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
 - b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

- A. Submit product data and drawings for review in accordance with the requirements of Division 01.
- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

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- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
- D. Shop Drawings - Seismic Controls:
 - 1. Include dimensioned plan views and sections indicating proposed fire suppression component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
 - 2. Identify mounting conditions required for equipment seismic qualification.
 - 3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
 - 4. Indicate proposed arrangement of distributed system trapeze support groupings.
 - 5. Indicate proposed locations for distributed system flexible fittings and/or connections.
 - 6. Indicate locations of seismic separations where applicable.
- E. Seismic Design Data:
 - 1. Compile information on project-specific characteristics of actual installed fire suppression components necessary for determining seismic design forces required to design appropriate seismic controls.
- F. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.
- G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Evidence of qualifications for seismic controls designer.
- I. Evidence of qualifications for manufacturer.
- J. Manufacturer's detailed field testing and inspection procedures.
- K. Field quality control test reports.

1.07 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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- C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in State in Which the Project Is Located and with minimum five years experience designing seismic restraints for nonstructural components.
 - 1. Designer may be employed by the manufacturer of the seismic restraint products.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing fire suppression equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
 - 1. Select vibration isolators to provide required static deflection.
 - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
 - 3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
 - 4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
 - 5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch (50 mm) operating clearance beneath base unless otherwise indicated.

2.02 SEISMIC CONTROL REQUIREMENTS

- A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.
- B. Seismic Design Criteria: As indicated on structural drawings.
- C. Seismic Restraints:

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1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Seismic Restraint Exemptions, All Seismic Design Categories:
 - a. Fire Suppression Piping Exemptions, All Seismic Design Categories:
 - 1) Lateral sway bracing for piping individually supported within 6 inches (150 mm) of the structure measured between the top of pipe and the point of attachment to the structure, where all conditions for exception specified in NFPA 13 are met.
 - 2) Lateral sway bracing for branch lines smaller than 2-1/2 inches (65 mm) in diameter, where branch line restraint is provided in accordance with NFPA 13.
3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
 - a. ASHRAE (HVACA).
 - b. FEMA 412.
 - c. FEMA 413.
 - d. FEMA 414.
 - e. FEMA E-74.
 - f. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Type Vibration Isolators:
 - a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
6. External Seismic Snubber Assemblies:
 - a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).

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- b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.

7. Seismic Restraint Systems:

- a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.
- b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
- c. Use only cable restraints to restrain vibration-isolated fire suppression components.
- d. Use only one restraint system type for a given fire suppression component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
- e. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.
- f. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported fire suppression component weight.
- g. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported fire suppression component weight.
- h. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
- i. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
- j. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
- k. Manufacturer's certified seismic restraint design may be submitted as an alternative to project-specific design and documentation, subject to approval of authorities having jurisdiction.

D. Seismic Attachments:

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1. Comply with support and attachment requirements of NFPA 13.
2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
4. Do not use power-actuated fasteners.
5. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.
6. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
7. Concrete Housekeeping Pads:
 - a. Increase size of pad as required to comply with anchor requirements.
 - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

2.03 VIBRATION ISOLATORS

A. Manufacturers:

1. Vibration Isolators:
 - a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com.
 - b. Mason Industries; _____: www.mason-ind.com.

B. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
 - a. Color code or otherwise identify springs to indicate load capacity.
 - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.

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- c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
 - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
 - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
 - f. Selected to function without undue stress or overloading.
3. Seismic Snubbing Elements for Seismic Isolators:
- a. Air Gap: Between 0.125 inches (3 mm) and 0.25 inches (6 mm) unless otherwise indicated.
 - b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch (6 mm) thick; capable of being visually inspected for damage and replaced.
- C. Vibration Isolators for Seismic Applications:
1. Resilient Material Isolator Mounts, Seismic:
 - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
 2. Restrained Spring Isolators, Seismic:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
 - b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
 - d. Provides constant free and operating height.
 3. Resilient Material Isolator Hangers, Seismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator

Freestanding MOB Buildout for Sullivan Community Hospital – 23987.02 material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.

4. Spring Isolator Hangers, Seismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
5. Combination Resilient Material/Spring Isolator Hangers, Seismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.04 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

- A. Manufacturers:
 1. External Seismic Snubber Assemblies:
 - a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com.
 - b. Mason Industries; _____: www.mason-ind.com.
- B. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.
- C. Seismic Snubbing Elements:
 1. Air Gap: Between 0.125 inches (3 mm) and 0.25 inches (6 mm) unless otherwise indicated.
 2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch (6 mm) thick; capable of being visually inspected for damage and replaced.

2.05 SEISMIC RESTRAINT SYSTEMS

- A. Manufacturers:
 - 1. Seismic Restraint Systems:
 - a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com.
 - b. Mason Industries; _____: www.mason-ind.com.
- B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.
- C. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.
- D. Cable Restraints:
 - 1. Comply with ASCE 19.
 - 2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
 - 3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
 - 4. Use protective thimbles for cable loops where potential for cable damage exists.
- E. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01-4533 and statement of special inspections as required by applicable building code.
- B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
 - 1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.

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2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- C. Seismic special inspections include, but are not limited to:
 1. Verification of required clearances between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.
- D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.
- E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Secure fasteners according to manufacturer's recommended torque settings.
- C. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- D. Seismic Controls:
 1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
 2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
 3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
 4. Equipment with Sheet Metal Housings:
 - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
 - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
 - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.

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5. Concrete Housekeeping Pads:
 - a. Size in accordance with seismic design to meet anchor requirements.
 - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

6. Seismic Restraint Systems:
 - a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
 - b. Install restraints within permissible angles in accordance with seismic design.
 - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
 - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
 - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

END OF SECTION

SECTION 21-1313
FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Materials and labor required to completely execute the sprinkler and fire protection work for this project, as indicated on the drawings and as herein specified including but not limited to:
 - 1. Hydraulic design of fire sprinkler system.
 - 2. Shop drawings.
 - 3. Exterior pipe, fittings and valves.
 - 4. Interior pipe, fittings and valves.
 - 5. Wet-Pipe Risers and accessories.
 - 6. Hangers, supports and sleeves.
 - 7. Sprinkler heads and extra sprinkler cabinet(s).
 - 8. Flushing and testing of complete fire sprinkler system, including valves, and test connections.
 - 9. Demonstration of system operation and performance to Authorities Having Jurisdiction and Owner's representatives.

1.02 RELATED REQUIREMENTS

- A. Division 01: Seismic Requirements
- B. Section 07-8400 - Firestopping
- C. Section 21-0500 - Common Work Results For Fire Suppression
- D. Division 26: Electrical

1.03 REFERENCE STANDARDS

- A. NFPA 13: Standard for the Installation of Sprinkler Systems
- B. NFPA 14: Standard for the Installation of Standpipe and Hose Systems
- C. NFPA 24: Installation of Private Fire Service Mains and Their Appurtenances
- D. NFPA 101: Life Safety Code

1.04 INSTALLER QUALIFICATIONS

- A. Comply with local and state licensure requirements for installation of fire suppression systems.

1.05 DESIGN REQUIREMENTS

- A. Design 100% hydraulically calculated, automatic sprinkler system as applicable in accordance with Owner's insuring agency guidelines, NFPA 13 and 14, and state and local code requirements.
- B. Design system to serve entire project unless otherwise indicated on drawings.
- C. Design system with sprinkler zones as indicated on drawings. Pipe/mains sizes indicated on drawing shall not be reduced without engineer of record approval.
- D. Base design on the following criteria:
 - 1. Light hazard occupancy in all areas except as noted herein or shown on drawings: 0.10 GPM/SF over most remote area of 1500 SF.
 - 2. Ordinary hazard Group 1 for mechanical equipment rooms, storage rooms, and other areas indicated on drawings: 0.15 GPM/SF over most remote area of 2000 SF.
 - 3. Minimum excess pressure of 10 psi including required hose stream allowance and sprinkler requirements.
 - 4. Maximum pipe velocity of 25 feet/second or as limited by insuring agent.
 - 5. Hose stream allowance based on occupancy classification of remote area in addition to sprinkler demand or as required by Owner's insuring agency:
 - a. Light hazard - 100 GPM
 - b. Ordinary hazard - 250 GPM
 - 6. A minimum of 18 inches clearance between bottom of sprinkler deflector and top of storage shelving.
 - 7. Include a 3/4" ball drip for all types of fire department connections. Route discharge to outside of building.
 - 8. Obtain a current flow test. Base design on results of a recent flow test, not more than one month old, to determine the adequacy of the water supply at the project site. Submit flow test location and results with sprinkler system drawings and calculations.

9. Use standard coverage sprinkler heads. Extended coverage heads shall not be used.

1.06 SYSTEM DESIGN

- A. Contract Documents require a complete 100% hydraulically calculated automatic wet pipe sprinkler system. Drawings specifically include:
 1. Pipe sizes based on hydraulic calculations
 2. Center to center dimensions for head location
 3. One calculated area per zone
 4. Node identification for the calculated areas
 5. Head types
 - a. Sprinklers shall be referred to on the drawings and shall be specifically identified by the listed manufacturer's style or series designation. Trade names and abbreviations are not permitted.
- B. Hydraulic calculations for the complete sprinkler system are included as part of the Contract Documents.
 1. If for economic reasons Contractor desires to resize or significantly reroute sprinkler piping, include cost for Engineer of Record to redesign system, modify hydraulic calculations, and to resubmit Contract Documents for approval by authority having jurisdiction.

1.07 SUBMITTALS

- A. Prepare complete detailed working drawings and calculations for the fire protection systems.
- B. Submit drawings and calculations to the State and Local Fire Marshal and to the Owner's Insuring Agency for approval.
- C. After receiving approval from State, Local Fire Marshal and Owner's Insuring Agent, submit shop drawings and calculations for review prior to start of installation. Submitted shop drawings shall bear State, Local Fire Marshal's and Owner's Insuring Agent approval stamp. Sprinkler installation shall not commence prior to obtaining approval of the listed authorities.
- D. Purpose of shop drawing is to convey that contractor understands intent of Contract Documents and to facilitate coordination of sprinkler system with HVAC ductwork, piping and other trades.

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- E. Upon completion of the fire sprinkler system installation, an on-site inspection shall be conducted by the engineer to verify that the installation is in accordance with the design and NFPA 13 requirements.
- F. Upon completion of required corrections, if any, verified by the engineer, written certification by the engineer stating that the fire sprinkler system and the water supply (source shall be indicated) is installed in accordance with NFPA 13 requirements shall be provided. The certification shall state that the sprinkler system design and installation comply with NFPA 13 (year of edition must be given) requirements. Approval of the fire sprinkler system (both design and installation) is mandatory before permission to occupy the area protected by the fire sprinkler system can be given by the state.
- G. Submit for review detailed shop drawings and product data for the sprinkler system in accordance with the requirements of Division 01.
- H. Include at a minimum the following manufacturer's product data with shop drawings:
 - 1. Sprinkler Heads
 - 2. Interior Valves
 - 3. Exterior and Interior Pipe and Fittings
 - 4. Hangers and supports
 - 5. Water flow, pressure and supervisory switches
- I. Submit shop drawing and submittal data to Owner's Insuring Agency for approval.

1.08 QUALITY ASSURANCE

- A. Use only Underwriters Laboratories (U.L.) listed and Factory Mutual (F.M.) approved material.
- B. The automatic sprinkler system installer shall provide a permanently attached nameplate located at the controlling riser, indicating the location and the discharge densities over designed areas of discharge including gallons per minute and residual pressure, and hose stream demand supplied by the sprinkler piping.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in the section with a minimum of 5 years of documented experience.
 - 1. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

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- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories (UL) or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 PROJECT CLOSE-OUT DOCUMENTS

- A. Include fire sprinkler as-constructed drawings in project close-out documents.
- B. Comply with requirements specified in Division 01.

PART 2 - PRODUCTS

2.01 VALVES

- A. Acceptable Manufacturers: Victaulic, Globe, Nibco, Crane, Stockham, Grinnell, Mueller, Watts, Hersey, Febco, Ames. Model numbers used are to establish required level of product quality.
- B. Interior valves:
 - 1. Alarm check valve: Victaulic Series 751 with Series 752 retard chamber, divided seat ring, rubber-faced clapper, UL listed and FM approved. Valve internal components shall be replaceable with valve in the installed position.
 - 2. Check valves:
 - a. Nibco No. F-908-W, UL Listed and FM approved, cast iron body, bolted bonnet, bronze mounted trim, horizontal swing, rubber seat with renewable seat and disc, 175 PSI WWP.
 - b. Victaulic Series 717, UL Listed, FM approved, ductile iron body, grooved ends or wafer style; welded-in nickel or rubber seat; stainless steel, elastomer coated ductile iron or bronze disc; spring actuated; stainless steel spring, pin and thrust bearing; 250 PSI WWP.
 - 3. Gate valves:
 - a. 2-1/2" and larger: Victaulic Series 771, UL Listed and FM approved, cast iron body, solid wedge, outside screw and yoke, grooved ends or flanged, 250 PSI WWP, pre-grooved stem for supervisory switch mounting.
 - 4. Butterfly valves:
 - a. Victaulic Series 705 with grooved ends, wafer or lug style, UL Listed, FM approved, 300 PSI WWP, ductile iron body, bubble-tight shutoff rated with weatherproof actuator housing and internal supervisory switches, ductile iron disc, stainless steel stem, EPDM molded-in pressure-responsive seat. The valve stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.

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5. Globe and Angle Valves (Trim and Drain Use):
 - a. 175 PSI minimum working pressure, UL Listed, 2" and smaller: bronze, renewable nitrile rubber seat disc, screwed.
6. Hose Valves:
 - a. Where pressure is 100 PSI or higher: 2-1/2" field adjustable pressure regulating angle valve, UL listed, cast brass, 400 PSI rated, hose thread outlet, brass finish with cap and chain. Potter-Roemer 4033 or approved equal.
 - b. 2-1/2" Angle hose valve: 2-1/2" angle hose valve, UL listed and FM approved, cast brass, 300 lb. rated, hose thread outlet, polished brass finish with cap and chain. Potter-Roemer 4065 or approved equal.
7. Ball valves:
 - a. Victaulic Series 728, threaded or grooved, UL listed, FM approved, bronze body and stem, two piece, weatherproof actuator housing and internal supervisory switches, 300 psi WWP, chrome plated brass ball, PTFE seat ring.
8. Water Motor Alarm: Victaulic Series 760, hydraulically operated impeller type alarm with aluminum alloy red enameled gong and motor housing, nylon bearings and inlet strainer.
9. Electric Alarm: Electrically operated horn/strobe device with pressure alarm switch. Interlock horn/strobe operation with fire alarm system.

2.02 PIPE AND FITTINGS

- A. Underground Pipe and Fittings:
 1. Ductile Iron Pipe:
 - a. Acceptable Manufacturers: U.S. Pipe, Clow, American.
 2. PVC Pipe:
 - a. Acceptable manufacturers: Clow "Super Main 900"; Manville "Blue Brute"; CertainTeed "VinylIron", H&W Industries, Inc.
 - b. Minimum Class 100 in accordance with AWWA C900.
 3. Joints and fittings:
 - a. Cement-lined, ductile iron.(AWWA C110/ANSI 21.10 and ANSI/AWWA C104/A21.4)

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- b. Push-on joints (AWWA C111/ANSI 21.11). Where joint restraint is needed, provide restrained push-on joint pipe and fittings in accordance with ANSI/AWWA C151/A21.51 and C111/A21.11.
 - c. Mechanical joint, bell with flange, cast iron gland, rubber gasket and bolts and nuts, U.L. listed and F.M. approved. (ANSI/AWWA C110/A21.10)
4. Material used shall be approved by local code authorities.
- B. Interior Standpipe and Sprinkler Pipe and Fittings:
- 1. Schedule 40 ASTM-135, electric-resistance welded steel pipe for pipe sizes 2" and smaller.
 - 2. Schedule 10 ASTM-135, electric-resistance welded steel pipe suitable for roll grooving for pipe sizes 2-1/2" and larger.
 - 3. Sprinkler piping and fittings shall be Schedule 40 galvanized or ASTM-A135 ERW black steel for dry pipe systems and pre-action systems, where piping is exposed to weather or located in a corrosive environment.
 - 4. Fittings:
 - a. Mechanical couplings: Roll or cut groove rigid type by Victaulic, Central Grooved, or Anvil. Couplings consist of two ductile iron housing segments, pressure responsive elastomer gasket, and ASTM A449 zinc-electroplated steel bolts and nuts.
 - 1) Rigid: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity, support and hanging in accordance with NFPA 13. Couplings shall have full pad to pad contact when installed correctly. Victaulic Style 009, 107N or equivalent.
 - 2) Flexible: Use in locations where vibration attenuation and stress relief are required. Victaulic Style 177 Installation-Ready, Style 77 or equivalent.
 - b. Class 125 in accordance with ANSI B16.4 or Class 250 in accordance with ANSI B16.3 cast iron sprinkler fittings - screwed, flanged, or short-pattern grooved-end, Victaulic Firelock, or equivalent.
 - c. Victaulic Installation-Ready fittings for Schedule 40 and Schedule 10 grooved end steel piping sizes 1-1/4" through 2-1/2". Fittings shall consist of a ductile iron housing with Installation-Ready end complete with prelubricated Grade "E" EPDM Type A gasket and ASTM A449 electroplated steel bolts and nuts. UL Listed for a working pressure of 300 PSI and FM approved for working pressure of 365 PSI.

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- d. All fittings shall be by the same manufacturer.
 - 5. Sprinkler fittings for use in areas with lay-in suspended ceilings and grids and hard-lid ceilings may use a flexible Stainless Steel hose and Steel Bracket assembly. The hose shall be Series AH1 with 3" bend radius or AH2 with 2" bend radius Vic Flex, or equivalent, with Style AB1 in FM approved Zinc-Plated Carbon Steel open gate brackets. The bracket shall allow installation before the ceiling tile is in place. Stainless Steel braided hose shall be 48" maximum length with EPDM Gasket Seal, Nylon isolation ring, Zinc-Plated Carbon Steel nut and nipple with zinc-plated carbon steel reducer. The hose shall carry UL listing for service to 200 PSI and have FM approval.
- C. Drain Piping:
- 1. Schedule 40, A106 or A120, galvanized pipe
 - 2. Fittings: Class 250 malleable iron, screwed with galvanized coating

2.03 HANGERS AND SUPPORTS

- A. Acceptable manufacturers: Anvil, B-line, Viking, Reliable, Empire, Fee and Mason. Anvil model numbers are used to establish level of product quality.
- B. Provide UL Listed and FM approved hangers.
- C. Hangers:
 - 1. Anvil #260 MSS, Type 1 for pipe 2-1/2" through 12"
 - 2. Anvil Figure #104, Type 6, adjustable split ring for pipe less than 2"
 - 3. Anvil #69 for pipe 1/2" through 2"
- D. Clamps:
 - 1. Riser Clamps: Anvil #261, MSS Type 8, at floor slab penetrations to support risers
 - 2. C-Clamps: Anvil #92 with retainer clip, MSS Type 23
 - 3. Malleable Beam Clamps: Anvil Figure #218, MSS Type 30
- E. Sidewall Hanger Bracket: Tolco Figure 58 Threaded side beam bracket, carbon steel, UL and FM approved; fastener and rod sizes as recommended by manufacturer based on pipe size and weight.
- F. Inserts:
 - 1. Concrete insert: Anvil Figure #281, MSS Type 18, universal concrete insert, adequately sized and correctly positioned to support full load.

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2. Lightweight concrete: Anvil #285.
3. Continuous Concrete Insert: Anvil Powerstrut #PS-349, pregalvanized.
4. Power Insert: HILTI HDI expansion anchor. Use in conjunction with all thread rods.
5. Power inserts shall not be used in post tension construction unless approved by Structural Engineer.

2.04 SPRINKLER HEADS

- A. Acceptable Manufacturers: Victaulic, Globe, Reliable Sprinkler Company, Automatic Sprinkler Company, Viking, Tyco Fire Products.
- B. Sprinklers shall be glass bulb type, with hex-shaped wrench boss integrally cast into the sprinkler body. Sprinkler wrenches shall be provided by the sprinkler manufacturer.
- C. Split-ring type escutcheons are not acceptable.
 1. Escutcheons and guards shall be Listed and supplied with the sprinkler head by the sprinkler manufacturer.
- D. Sprinkler heads shall be UL Listed and FM approved. Concealed type quick response sprinkler head may be UL listed only.
- E. Provide quick response sprinkler head throughout smoke compartments containing patient sleeping rooms.
- F. Provide quick response heads in all light hazard areas and in concourses.
- G. Provide sprinkler heads as follows:
 1. Brass U-Right: Victaulic V2703, bulb type, 1/2" orifice, upright. Quick response Victaulic V2704.
 2. Chrome Pendent: Victaulic V2707, bulb type, 1/2" orifice, pendent. Quick response Victaulic V2708.
 3. Horizontal Sidewall: Victaulic V2709, solder type, 1/2" orifice. Quick response Victaulic V2710, 1/2" bulb type.
 4. Concealed: Victaulic V38, bulb type, 1/2" orifice. Quick response bulb type, 1/2" orifice.
 5. Window Sprinkler: Victaulic V10 quick response, bulb type, 1/2" orifice.

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6. Provide polyester coated heads in corrosive environments and exterior over hangs.
- H. Provide the following sprinkler heads of the proper type, rating and spacing. Appropriate must be compatible with room finishes. Split-ring type escutcheons are not acceptable.
1. Acceptable manufacturer: Reliable Sprinkler Company - no substitutions. Reliable model numbers are indicated below unless noted otherwise.
 2. Brass-upright: Model G, bulb type 1/2" orifice. Quick response: Model FIFR, bulb type, 1/2" orifice.
 3. Chrome pendant: Model Quick response: model FIFR, bulb type, 1/2" orifice. Quick response: model FIFR, bulb type, 1/2" orifice.
 4. Horizontal sidewall: Model G, bulb type, 1/2" orifice Quick response: model FIFR, bulb type, 1/2" orifice.
 5. Concealed, fully recessed: Model GI solder type, 1/2" orifice. Quick response G4A, solder type, 1/2" orifice.
- I. Provide one sprinkler cabinet with 6 extra sprinkler heads and sprinkler wrench for emergency use. Locate cabinet in maintenance area. Provide a minimum of two extra sprinkler heads of each type sprinkler head used for the project. Add an extra sprinkler cabinet if necessary to house the spare heads.

2.05 SWITCHES

- A. Provide supervisory switches for all fire/sprinkler system control valves unless noted otherwise.
- B. Flow switch: System Sensor WFDN Series or Potter Model No. VSR vane type flow switch with pneumatic retard adjustable from 0 to 70 seconds, complete with two sets of single pole, double throw (SPDT) switches; UL Listed and FM approved.
- C. Supervisory switch: System Sensor OSY2 or Potter Model No. OSYSU-2 with two sets of SPDT contacts; UL Listed and FM approved, for 1/2-inch to 12-inch valves. Provide rod extension for 3" and larger valves as needed for proper operation.

2.06 WATER FLOW ALARMS

- A. Connect water flow alarms to alarm check valves with bell located on outside of building. Provide other flow switches as shown on drawings and connect to fire alarm system.
- B. Drain valves: Provide drain valves as required by NFPA 13

2.07 PRESSURE GAUGES

- A. Gauges: Potter-Roemer #FP3526 stainless steel and liquid filled with protective cover, designed for 0-300 PSI.

2.08 INSPECTORS TEST ASSEMBLY

- A. Cabinet: Potter-Roemer #1812-C white baked enamel, minimum 6-1/2" deep, steel box with full acrylic panel.
- B. Test module: Victaulic "Test Master II" Style 720, threaded , with combination sight glass and 1/2" orifice.
- C. Finish: Paint exterior cabinet frame to match wall surface and color.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate installation to avoid interference with other systems.
- B. Provide power and interlock wiring under and in accordance with Division 26.

3.02 PIPE INSTALLATION

- A. Connect to water main as shown on drawings. Install concrete anchor and thrust block at each change in direction of pipe. Provide restrained push-on or mechanical joints in ductile iron pipe as needed.
- B. Install underground pipework to provide a minimum cover of 2.5 feet; 3 foot cover under driveways and roads, or one foot below frost line as required per NFPA 24 Figure A.10.4.1., whichever is greater.
- C. Flush the fire service mains before connecting to sprinkler branch piping system.
- D. Exterior underground piping shall be buried with a permanent, bright colored, continuous printed plastic tape. Tape shall be intended for direct burial and buried directly above fire protection main. Tape shall be 6" wide, 4 mils thick. Tape shall be printed with proper identification of service located below.
- E. Install sprinkler pipe a minimum of 12" above top of ceiling to allow for removal of ceiling tile and lighting fixtures and for access to equipment above the ceiling.
- F. Support vertical pipe risers at 12' maximum distance or at least once at each floor.
- G. Use hanger types as specified in Part 2 above. This shall overrule hanger types outlined in NFPA 13.
- H. Hanger spacing shall be in accordance with NFPA 13.

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- I. Provide hangers on all arm outs of 12" or more.
- J. Seal penetrations of fire rated walls and floors in accordance with U.L. Fire Resistance Index for Through-Penetration Firestop Systems. Coordinate requirements with Division 07.
- K. Provide trapeze type hangers where necessary to support pipe when structural steel or clear path to deck is not directly above piping for support.
- L. Hydrostatically test all piping and systems per NFPA requirements.
- M. Install test tees with plugs for pressure-regulating devices testing.
- N. Grooved Joints: Install in accordance with the manufacturer's latest published installation instructions. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from the pipe end to and including the groove. Gasket shall be manufactured by the coupling manufacturer and verified as suitable for the intended service.
 - 1. A factory trained representative of the coupling manufacturer shall provide on-site training for the contractor's field personnel in the use of grooving tools, application of the groove, and product installation.
 - 2. The representative shall periodically visit the job site and review the installation to ensure best practices in grooved joint installation are being followed.
 - 3. Contractor shall remove and replace any improperly installed or damaged products.

3.03 SPRINKLER INSTALLATION

- A. Install sprinkler heads and required piping in areas such as concealed spaces, kitchen hoods, lab hoods, dietary freezer and chill boxes and other special areas and spaces as required by NFPA 13, NFPA 101, and the IBC.
- B. Sprinkler heads shall be of the intermediate or high-temperature rating defined in NFPA 13, Chapter 8, when placed near heat sources including heating ducts, unit heaters, steam piping, concealed spaces, skylights walk-in coolers with automatic defrosting and similar spaces as designated and as defined in NFPA 13.
- C. Provide drain valves, pipes and test connections as required by NFPA 13. Pipe drain lines and test connections to outside building or as shown and detailed on Drawings. Originate test lines from most hydraulically remote point of each sprinkler zone.
- D. Install sprinkler heads centerline of corridors and locate in the center of the ceiling tiles. Install sprinkler heads in other designated spaces in the center of the ceiling tiles and symmetrically locate with other heads within the ceiling. Do not install sprinkler heads in other locations any closer than six inches to any ceiling grid or wall.

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- E. Do not install any sprinkler heads that have been dropped, damaged, or show visible loss of fluid. Sprinkler heads with cracked bulbs shall not be installed.
- F. Sprinkler bulb protectors shall be removed by hand after installation. Do not use tools or any other device to remove the protector that could damage the bulb.
- G. Provide head guards on heads below 7'-6" above floor or walkway and where heads may be subject to damage.
- H. When exposed sprinkler piping is painted the installed sprinkler heads shall be bagged and banded to protect the sprinkler heads. Do not use tape for bagging the sprinkler heads. If tape or paint gets on the sprinkler head, the sprinkler head will lose its listing and shall be replaced.
- I. Refer to Architectural reflected ceiling plans as required.

3.04 CLOSEOUT ACTIVITIES

- A. Refer to Division 01 for submittals, documentation and additional requirements for this project.
- B. Demonstrate proper operation of equipment to Owner's representative and AHJ.
- C. Demonstrate operation of fire systems to AHJ and Owner's representative.
 - 1. Use operation and maintenance manual during demonstration.
 - 2. Conduct walking tour of project.
 - 3. Briefly describe function, operation and maintenance of each component.
- D. Training: Train owner's personnel on operation and maintenance of system using operation and maintenance manuals as required. Supplement training with manufacturer's training personnel when required or requested by the owner.

END OF SECTION

SECTION 22-0500
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Common work results for requirements specifically applicable to Division 22.
- B. Requirements of Division 01 Specifications, General Provisions of the Contract and General and Supplementary Conditions apply to this Division.

1.02 REGULATORY REQUIREMENTS

- A. Perform Work specified in Division 22 in accordance with the codes and standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect.
 - 1. NFPA 101: Life Safety Code
 - 2. ANSI Handicapped Code-A117.1
 - 3. U.L Fire Resistance Index
 - 4. ASTM E814-08B: Standard Test Method for Fire Tests of Penetration Firestop Systems
 - 5. IBC: International Building Code, with Mechanical and Plumbing Codes
 - 6. NFPA 70: National Electrical Code
 - 7. NFPA 72: National Fire Alarm and Signaling Code
 - 8. NFPA 99: Health Care Facilities Code.
 - 9. NFPA 101A: Guide on Alternative Approaches to Life Safety
 - 10. NFPA 101B: Standard on Means of Egress for Buildings and Structures
 - 11. NFPA 105: Recommended Practice for the Installation of Smoke Control Door Assemblies
 - 12. NFPA 241: Standard for Safeguarding Building Construction, Alteration and Demolition Operations
 - 13. FGI Guidelines for Design and Construction of Health Care Facilities
 - 14. Special regulations, supplements, and amendments of the State and/or local authorities having jurisdiction.

1.03 REFERENCE STANDARDS

- A. AGA: American Gas Association
- B. ANSI: American National Standards Institute
- C. ASME: American Society for Mechanical Engineers
- D. ASTM: American Society for Testing and Materials
- E. AWWA: American Water Works Association
- F. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry
- G. NEMA: National Electrical Manufacturers' Association
- H. NFPA: National Fire Protection Association
- I. UL: Underwriters' Laboratories, Inc.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 01 including required number of copies.
- B. Include Products as specified in the individual sections of Division 22.
- C. Prepare shop drawings completely independent of the Engineer of Record's CADD files. Should the Contractor or Vendor wish to use the Engineer of Record's CADD files or Revit model as the basis for developing their shop drawings, a release form, obtainable from the Engineer or Architect, must be signed.
- D. Submit copies of shop drawings in accordance with Division 01, for plumbing equipment and piping systems including:
 - 1. Concrete pads and foundations including anchor bolt and sleeve locations.
 - 2. Prepare and submit coordination drawings specified herein. Facilitate the coordination effort with other trades, specifically Divisions 21, 23, 26 and 28.
- E. Brochures: Submit manufacturer's product data and brochures including:
 - 1. Complete descriptions.
 - 2. Illustrations and wiring diagrams.
 - 3. Rating data, accessories, dimensional data, and applicable options and features marked for the specific items scheduled on drawings and specified herein.
 - 4. Capacities stated in the terms specified

1.05 QUALITY ASSURANCE

- A. Lead Free: All wetted surface of pipe, fittings and fixtures in potable water systems shall have a weighted average lead content equal to or less than 0.25% per the Safe Drinking Water Act (Section 1417) as amended January 4, 2011.
- B. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.

1.06 FIELD CONDITIONS

- A. Layouts indicated on drawings are diagrammatical and intended to show relative positions and arrangement of piping and equipment. Coordinate work with other trades and with measurements obtained at the job site, as applicable, prior to installation. Generally, install work in locations shown on Drawings. Provide necessary rises, drops, and offsets to fit in the available space unless prevented by Project conditions.
- B. If prevented by project conditions, prepare drawings showing proposed rearrangement of Work, including changes to Work specified in other sections. Obtain permission of the Architect before proceeding.
- C. Place anchors, sleeves, and supports prior to pouring concrete or installation of masonry work.
- D. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption in advance with Owner and all affected trades.
- E. Determine sizes and verify locations of existing utilities on or near site.
- F. Keep roads and other spaces clear of materials and debris.
- G. Visit site and be informed of conditions under which Work must be performed.
- H. Locate equipment requiring periodic servicing so that it is readily accessible. Provide means of service access, following appropriate manufacturer's recommended service clearance space or, as applicable, means of access using duct, wall, or ceiling access doors.
- I. Install piping to leave sufficient space for AHJ inspection of wall construction. Coordinate pipe routing with other trades including but not limited to Divisions 21, 23, 26 and 28.

1.07 FEES AND PERMITS

- A. Obtain and pay for all necessary permits and inspection fees required to perform Division 22 work.

1.08 COORDINATION DRAWINGS

- A. Prior to commencement of installation, assist in preparation of coordination drawings for work under this Division, as specified in Division 01. Fully cooperate with persons coordinating and performing work under other Divisions.
- B. Drawings shall not be formally submitted but shall be kept on site for reference. Notify the Architect of conflicts that cannot be resolved.

1.09 COMPLETENESS OF WORK

- A. The Contract Documents depict plumbing systems which are intended to be complete and functioning systems. All products, materials, and labor necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the Contractor.
- B. Catalog numbers referenced throughout the Division 22 Drawings and Specifications are intended to convey a general understanding of the type and quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra shall be allowed because a catalog number is found to be incomplete or obsolete.

1.10 PRODUCT SUBSTITUTIONS

- A. Comply with provisions of Division 01.

1.11 PRODUCT PROCUREMENT AND SUBSTITUTION

- A. Comply with provisions of Division 01.

1.12 RECORD DRAWINGS

- A. Provide record drawings that illustrate the work of Division 22 as finally constructed. Deliver record drawings to the Architect in a form suitable for reproduction. Comply with the provisions and requirements of Division 01.
- B. Record drawings shall reflect all changes made to the Contract Documents, whether generated by addenda, change orders, or field conditions. Maintain a daily record of these changes and keep current set of drawings showing these changes.

1.13 OWNING AND OPERATING MANUALS

- A. Comply with the requirements of Division 01, but provide a minimum of three sets.
- B. Manuals shall include clear and comprehensive instructions with appropriate graphics and project specific marked data to enable owner to operate and maintain all systems specified in this Division.
- C. Copies of reviewed submittals for furnished equipment shall be included.

PART 2 - PRODUCTS

2.01 EQUIPMENT SUPPORTS

- A. Structural steel for supports: ASTM A36.
- B. Use galvanized members installed in areas of high humidity or condensation, and outside.
- C. Furnish other members with shop coat of red primer.
- D. Retouch primer after field welding.

2.02 FLASHINGS AND COUNTERFLASHINGS

- A. Furnish materials and coordinate installation for flashing and counterflashing roof penetrations for vents, pipe, drains, and ducts.
- B. Materials:
 - 1. Sheet metal: 24-gauge minimum ASTM A525, Class G90
 - 2. Sheet lead: 3 pounds per square foot
 - 3. Stainless steel: Minimum 20 gauge
 - 4. Sheet copper: 24 OZ/SF
- C. Vent Stack Fitting (threaded roof coupling): Josam 26450 or Jay R. Smith 1750.

2.03 WALL AND CEILING ACCESS PANELS

- A. Style and type as required for material in which installed.
- B. Size: 12"x12" minimum, as indicated, or as required to allow inspection, service and removal of items served.
- C. 14-gauge minimum sheet metal for doors, 16-gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.
- D. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.
- E. Prime painted or rust inhibitive paint finish.
- F. UL labeled when in fire-rated construction, 1-1/2 hour rating.

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- G. 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 valves, and equipment needing periodic or replacement maintenance.
- H. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.
- I. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers.
 - 1. For masonry and drywall construction: Milcor Style M
 - 2. For plastered masonry walls and ceiling: Milcor Style K
 - 3. For ceramic tile or glazed structural tile: Use stainless steel panels

2.04 PIPE ENCLOSURES

- A. For exposed vertical piping in kitchen: 18 gauge stainless steel (type 302) with No. 4 finish.
 - 1. Extend from 2" above ceiling to equipment or island partition
 - 2. Size covers to contain number of pipes served
- B. Minimize number of covers by enclosing maximum number of pipes in each drop.
- C. Anchor to equipment or partition.
- D. Fasten seams and joints with stainless steel pop rivets.
- E. Provide 1-1/2" ceiling flange as closure.

2.05 PROTECTION AGAINST CONTACT

- A. Metallic piping, except for cast iron, ductile iron and galvanized steel, shall not be placed in direct contact with steel framing members, concrete or cinder walls and floors or other masonry. Metallic piping shall not be placed in direct contact with corrosive soil. Where sheathing is used to prevent direct contact with the soil, the sheathing shall have a thickness of not less than 0.008 inch (8 mil) and the sheathing shall be made of plastic.
- B. Where piping penetrates rated walls, partitions and floors, sleeves and fire safing shall be used to maintain the integrity of the wall or floor.

2.06 SLEEVES

- A. Materials:
 - 1. Concrete floors, concrete and masonry walls: 18 gauge galvanized steel tube with welded longitudinal seam or Sch. 10 galvanized steel pipe.

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2. Drywall partitions: 18 gauge galvanized steel sheet metal or Sch. 10 galvanized steel pipe.
 3. Cast iron: Cast or fabricated 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, bolts and nuts for membrane flashing. Provide under deck clamp with clamping ring and set screws.
- B. Sleeves shall be sized such that the annular space between outside surface of pipe or pipe insulation and the inside surface of the sleeve is not less than 1/2". Provide larger annular space if required by firestopping product installation instructions or water proofing seal at exterior wall penetrations.
- C. Sleeves supporting riser piping 4" and larger shall have three 6" long reinforcing rods welded radially at 120 degree spacing to the sleeve and shall be installed with the rods embedded in the concrete slab as the floor slabs are poured.
- D. Exterior wall and floor penetrations shall be sleeved and sealed with a Link Seal Modular Seal by GPT Industries or Flexicraft Industries.
1. Exterior wall and floor penetrations: Install Link Seal Modular Seal by GPT or Flexicraft Industries. Seal shall be suitable for use in direct ground contact, water or atmospheric conditions with EPDM seal element. Provide Nitrile rubber seal element where subject to oils and fuel. All bolts, nuts and fasteners shall be Steel with 2-part Dichromate corrosion inhibiting coating or Type 316 Stainless steel.

2.07 ESCUTCHEON PLATES

- A. Provide B & C No. 10 or equal chrome plated escutcheon plates where pipes penetrate partitions or ceilings in finished spaces or areas.

PART 3 - EXECUTION

3.01 EXCAVATING AND BACKFILLING

- A. Contractor shall review Divisions 31 and 33 and shall perform excavation and backfilling in accordance with the most stringent requirements. Contractor shall request clarification before proceeding if there are conflicting instructions.
- B. Contract Documents show the approximate location of underground utilities known to exist in the area of construction. Contractor shall determine the exact location of utilities.
1. Locate and uncover existing utilities which require new connections before trenching in the vicinity of indicated utility connection.

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2. Clear all vegetation and other objectionable material from the area required for the excavation and backfill operations. Disposal of material removed by the clearing operation shall be approved by the Owner's representative.
- C. Provide trenching, excavating, and backfilling necessary for performance of work indicated in Contract Documents.
- D. Excavate to depths indicated on the drawings or as necessary to permit the installation of pipe, bedding, backfill, structures or appurtenances. Provide a firm, undisturbed, uniform surface in the bottom of trenches. Where excavation exceeds the required depth, bring the excavation to proper grade through the use of an approved incompressible backfill material. Store excavated material and dispose of surplus excavated material.
1. Excavate trench to sufficient depth to permit a minimum of 36" of cover over the top of the pipe unless otherwise required by pipe elevations indicated on the Drawings. The trench width shall be 18" plus the diameter of the pipe and/or the largest bell.
- E. Trenching and excavation shall be unclassified. No extra will be paid in the event that rock is encountered.
1. Should rock excavation be required, use only experienced personnel for blasting.
 2. Exercise extreme care when blasting with signals of danger given before firing any charge.
 3. Conform to and obey all public authority regulations for the protection of life and property.
- F. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition and to meet applicable codes.
- G. Provide a minimum of 6" of No. 67 crushed stone or clean sand bedding, or equal, in the bottom of the trench to maintain the required grade and continuous support of the bottom quadrant of the pipe. On bell and spigot piping, dig bell holes so bottom of bells do not support pipe.
- H. Upon completion of excavation, and prior to the laying of the pipe, the trench bottom shall be brought up to the required elevation with min. 6" pipe bedding. Pipe bedding shall be select material deposited in the trench, and shall be compacted, leveled off, and shaped to obtain a smooth compacted bed along the laying length of the pipe. Material for pipe bedding shall comply with local codes. In absence of local code requirements the bedding shall be bank sand or select back fill material approved by the Architect. Any material used shall pass a 1/4 inch screen.

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- I. Clean and inspect pipe for defects before lowering into trench for assembly. Install pipe in accordance with provisions of Contract Documents and with the recommendations of the pipe manufacturer.
 - 1. Ensure pipe is of proper strength and classification for specified service. Discard damaged or defective pipe discovered during pipe laying operations.
 - 2. Maintain alignment and grade during layout operation. Use acceptable method for maintaining grade and alignment to produce desired results.
- J. Where crushed stone backfill is required, use No. 67 stone, clean sand or equal.
- K. After bedding has been shaped and the pipe assembled, place crushed stone carefully around the pipe and to a point 12" above the pipe. Backfill above this point shall be as described below:
 - 1. Backfill areas of vehicular traffic shall consist entirely of crushed stone and compacted crusher run material.
 - 2. Backfill for shoulders of roadways, sidewalk, and slab on grade structures shall consist entirely of crushed stone.
 - 3. Backfill areas not subject to vehicular traffic may consist of suitable excavated material as described above.
- L. Where crushed stone is not required, suitable excavated material may be utilized. This includes fine, dry earth or a mixture of earth and shot rock. Rocks larger than 6" in any dimension may not be included in any portion of the backfill material.
- M. Trenches shall be backfilled only after piping has been inspected, tested, and approved by the Architect. All backfill material shall be placed in the trench either by hand or by approved mechanical methods. The compaction of backfill material shall be accompanied by tamping, with hand tools or approved pneumatic tampers, by using vibratory compactors, by puddling, or by any combination of the three. The method of compaction shall be approved and all compaction shall be done to the satisfaction of the Architect. Backfill completely around pipe, including 18" above the pipe, with suitable bank sand, tamped in 4" layers under, around, and over pipe. Water down backfill as required. The remainder of the backfill shall be select backfill material tamped at intervals of no more than 12" depths. All materials to be used as selected material backfill shall be approved by the Architect. If, in the opinion of the Architect, the excavated material does not meet the requirements of selected material, the Contractor shall be required to screen the material prior to its use as selected material backfill. Material used in the upper portion of the backfill or subgrade shall not contain stone, rock, or other material larger than six inches in its longest dimension. No wood, vegetable matter, or other material which, in the opinion of the Architect, is unsuitable shall be included in the backfill. The upper 24" of backfill may be water jetted, if desired. Backfill shall be brought up to finish grade identified on the Architectural

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Drawings, including additional backfill required to offset settlement during consolidation.

3.02 CUTTING AND PATCHING

- A. Repair or replace damage caused by cutting or installation of work specified in Division 22.
- B. Perform repairs with materials which match existing and install in accordance with the appropriate section of these specifications.

3.03 FLASHING AND COUNTERFLASHING

- A. Counterflash pipes where penetration of roofs and outside walls occur.

3.04 CONNECTION TO EQUIPMENT FURNISHED BY OWNER

- A. Connect or install equipment shown on plumbing drawings that requires plumbing connections.
- B. Provide piping, shutoff valves, unions, and other piping appurtenances required for a complete installation. Provide backflow preventers and/or pressure reducing valves where required by the equipment design or local code. All components shall be line size unless noted otherwise.

3.05 DELIVERY, STORAGE, AND PROTECTION

- A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where delivery in original packaging is not practical, provide cover and shielding for all items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storing to keep items from being damaged.
- B. Store items in a clean, dry place, and protect from damage. Plumbing equipment may not be staged or stored outdoors unless intended for outdoor use.
- C. Protect nameplates on motors, pumps, and similar equipment. Do not paint or insulate over nameplate data.
- D. Protect plumbing fixtures and brass or chromium plated trim, valves and piping from damage. Cover fixtures during work of finishing trades.
- E. Keep dirt and debris out of pipes.
- F. Repair, restore, and replace damaged items.
- G. Cover factory finished equipment during work of finished trades.

3.06 SLEEVES

- A. Floors and Roof Slabs: Sleeve all pipe penetrations including mechanical equipment rooms and other wet areas. Extend sleeve 2" above finished floor and roof, except piping within pipe chases. Sleeve shall be flush with underside of floor unless required for cast iron clamping ring to be secured.
- B. Masonry or concrete walls: Sleeve all pipe penetrations. Sleeves shall be flush on both sides of wall.
- C. Non-Rated Drywall partitions: Sleeves are not required, except in piping systems above 160 degrees F. Voids between pipe, pipe insulation and drywall shall be sealed with appropriate joint sealant material.
- D. Seal voids between outside surface of sleeve and wall, partition or floor. Seals shall be airtight.
- E. For all fire rated walls, floors and partitions install piping, insulation and sleeves in strict accordance with applicable U.L. Fire Resistance Index assembly and with firestop manufacturer's installation instructions for floor or partition penetrations. Coordinate installation and firestop material with Division 07 and Firestop Manufacturer's installation instructions.
- F. Clearance between sleeve and pipe: Minimum of 1/2 inch for hot piping and 1 inch for cold piping or as otherwise dictated by U.L. Fire Resistance Directory.
- G. Wall Penetrations not sleeved or firestopped:
 - 1. Seal voids between pipe and partition with appropriate joint sealant material. Seals shall be airtight.
- H. Core drilled holes in concrete floors: Sleeves are not required. Seal airtight and to maintain the floor rating integrity.

3.07 ESCUTCHEON PLATES

- A. Provide chromium plated escutcheon plates for exposed uninsulated pipes projecting through floors or wall in finished spaces. Mechanical rooms, storage rooms, electric closets and housekeeping closets are not considered finished spaces.
- B. Clearance between sleeve and pipe: Minimum of 1/2" for hot piping and 1" for cold piping or as otherwise dictated by the UL Fire Resistance Directory.

3.08 CLEANING PLUMBING SYSTEMS

- A. General Cleanup:
 - 1. Upon completion of contract and progressively as work proceeds, clean up dirt, debris, old materials, etc., and remove from site, keeping premises in neat and

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clean condition to satisfaction of the Architect. See Division 01 of specifications for further requirements.

2. Seepage, discoloration or other damage to parts of the building, its finish, or furnishings due to Contractor's failure to properly clean piping systems shall be repaired without cost to the Owner.

B. Factory Finishes:

1. Clean items with factory finishes. Touch up bare places, scratches and other minor damage to finishes. Use only factory supplied paint of matching color and formula. If finishes are badly damaged or if there are many damaged, scratched or bare places, refinish the entire item.

C. Domestic Water System:

1. Flush system progressively by opening building operable valves, faucets and hose bibs and permitting flow to continue from each unit until water runs clear.
2. Sterilize system in accordance with requirements of State Department of Public Health by the following method or other methods acceptable to authority having jurisdiction.
 - a. Introduce chlorine or a solution of calcium or sodium hypochlorite. Fill lines slowly and apply sterilizing agent at a rate of 50 ppm of chlorine as determined by residual chlorine tests at ends of lines. Open and close all valves while system is being chlorinated.
 - b. After sterilizing agent has been applied and left standing for 24 hours, test for residual chlorine at ends of lines. If test indicates there is less than 25 ppm, repeat sterilizing process.
 - c. After system has been standing 24 hours and test indicates at least 25 ppm of residual chlorine, flush out system until all traces of chemical used are removed.
3. Have local health department check and approve system before connecting it to existing water system.
4. If the domestic water system is sterilized more than 24 days prior to the owner/user taking beneficial occupancy, the entire water system shall be re-sterilized so that it is tested clean as noted above at the time of occupancy.
 - a. All piping, dead legs, safety showers, eyewashes, and faucets shall be opened and thoroughly flushed for at least 15 minutes prior to re-sterilization.
5. The domestic water system shall be tested for the presence of Legionella by a third party testing laboratory certified and experienced in Legionella testing prior

to the owner taking occupancy. The location and results of testing must be documented and presented to the owner.

6. If only a portion of the domestic water system was opened for repair or other construction such that the system was subjected to water pressure changes or stagnation, the water system or portions thereof shall be thoroughly flushed and sterilized by chlorination as described above.

3.09 TESTING PLUMBING SYSTEMS

- A. Test all systems and equipment installed to demonstrate proper operation.
- B. Advise the Architect of scheduled systems testing and completed system demonstration/operation schedules so that he may witness, if desired.
- C. Correct and retest work found defective or leaking when tested.
- D. Make repairs to piping systems with new materials. Peening, doping, or caulking of joints or holes will not be acceptable.
- E. Domestic Water Piping: Test hot and cold water piping systems upon completion of rough-in, before fixtures are connected, at a hydrostatic pressure of 125 psig or 150% of working pressure whichever is greater for a period of two hours.
- F. Natural Gas Piping: The test pressure to be used shall be no less 1 1/2 times the proposed maximum working pressure, but not less than 3 psi.
- G. Flush Valves: Test all flush valves for proper operation.
- H. Drainage and vent system
 1. Test plug opening(s) to permit system to be filled with water, and subject system to a 10 foot head of water pressure. System shall hold water for 30 minutes without a drop in water level in a 4 inch diameter standpipe, and without visible leakage.
 2. If system is tested in sections, a minimum head of 10 feet shall apply.
- I. All plumbing equipment and systems must be balanced by a certified third party as noted in Division 23 Testing and Balancing requirements.
- J. Records of Testing: Maintain records of system testing and results thereof. Deliver results as part of the project closing file and on an intermediate basis as requested by the Architect.

3.10 INFECTION CONTROL REQUIREMENTS

- A. Coordinate with the Owner the exact requirements for the infection control measures to be executed and performed during the course of this Project.

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- B. Prior to execution, present to the Owner for approval a written execution plan for each infection control measure.
- C. Coordinate infection control measures as needed with all other trades and disciplines.
- D. Provide documentation of infection control measures to the Owner, as required and specified in the ICRA.

END OF SECTION

SECTION 22-0523
VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Valves for plumbing systems.

1.02 SUBMITTALS

- A. Submit product data for review in accordance with the requirements of Division 01. Valves used or indicated to be used in domestic potable water systems must be lead free in accordance with the Reduction of Lead in Drinking Water Act effective January 4, 2014.

1.03 QUALITY ASSURANCE

- A. Lead Free: All wetted surface of pipe, fittings and fixtures in potable water systems shall have a weighted average lead content equal to or less than 0.25% per the Safe Drinking Water Act (Section 1417) as amended January 4, 2011.
 - 1. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.
- B. Valve bodies, shells, and seats: Factory tested.
- C. Bronze body valves:
 - 1. Materials for pressure containing parts: ASTM B-62 (less than 200 psi), B-61 (200 psi and above)
 - 2. Design, workmanship, testing: MSS-SP-80
- D. Iron body valves:
 - 1. Materials for pressure containing parts: ASTM A126, Grade B
 - 2. Face-to-face and end-to-end dimensions: ANSI B16.10
 - 3. Design, workmanship, testing: MSS-SP-70, 71
- E. Valve stems: ASTM B584-78, Class 13C (cast silicon brass), ASTM B-371-79, Alloy A (rolled silicon brass), or other material equally resistant to dezincification.
- F. Pressure castings: Free of impregnating materials.
- G. Valve name or trademark and working pressure stamped or cast into body.
- H. Standard for 200 PSI and 300 PSI valves with metallic seats: ASTM B61-76.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Iron body valves: Nibco, Apollo, Stockham, Crane, Milwaukee, Dezurik, Mueller or Kennedy
- B. Bronze body valves: Nibco, Apollo, Stockham, Milwaukee, Dezurik or Kennedy
- C. Ball valves: Nibco, Apollo, Watts, Milwaukee, Jamesbury or Hammond

2.02 MATERIALS

- A. Nibco Figure numbers are indicated below unless noted otherwise:
- B. Check Valves:
 - 1. Domestic Water:
 - a. 2" and less, Figure T-413-Y-LF, or S-413-Y-LF, threaded or solder, Lead Free silicone bronze body, Class 150, PTFE seat
 - b. 2-1/2" and up: Iron body, bronze alloy disc, bronze alloy or Buna-N seat, stainless steel spring, flanged, Class 125, Lead Free, globe style, F-910-LF; or F-960-LF, Class 250.
- C. Ball Valves
 - 1. Domestic Water
 - a. 2" and less, Figure T585-80-LF or S-585-80-LF, 2-piece, full port, 600 psi WOG, PTFE packing seal and seat ring, lead free silicone bronze alloy body and ball.
 - b. 2-1/2" and up, Watts G4000-FDA-Lead Free-200 psi, 2 piece, full port, cast iron, flanged, heat fused epoxy coating, stainless steel ball and stem, PTFE seat, Class 125 meeting MSS-SP-72-92 or equal.
 - 2. Provide ball valves with locking handles.
 - 3. Provide extended lever for insulated service.
- D. Valve connections: Two inches and smaller - threaded; 2-1/2 inches and larger - flanged.
- E. Provide chain operators for gate valves, ly valves, and plug cocks located in mechanical rooms as required by plumbing plans or where valves are mounted above 7'-0" A.F.F.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Furnish and install valves in each piping connection at each piece of plumbing equipment to allow equipment to be isolated from piping systems.
- B. Furnish and install valves in all piping systems to isolate each floor or main section of the building. Install sufficient number of valves to minimize the portion of the system which must be shut down for service or maintenance purposes.
- C. Furnish and install valves above each group of plumbing fixtures.
- D. Install valves in water piping systems so ordinary maintenance work can be performed on the equipment that the valves isolate, without having to drain the system beyond the valve.
- E. All valves above drywall access panels shall be located within one foot of access panels including valves located above ceilings.
- F. Locate valves so as to be easily accessible by maintenance personnel.
- G. All plumbing systems including pumps, domestic water piping and valve settings and hot water recirculation systems must be tested and balanced. Coordinate with Section 23-0593 - Testing, Adjusting, and Balancing for HVAC for test and balance requirements.

END OF SECTION

SECTION 22-0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hangers for plumbing piping

1.02 RELATED REQUIREMENTS

- A. Section 22-1116 - Domestic Water Piping
- B. Section 22-1316 - Storm And Sanitary Waste And Vent Piping
- C. Section 22-0700 - Plumbing Insulation

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- C. MFMA-4 - Metal Framing Standards Publication
- D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation
- E. NFPA 101 - Life Safety Code
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

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5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with the structural requirements.

1.05 DELIVERY, STORAGE AND PROTECTION

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

1.06 SUBMITTALS

- A. Submit product data and information in accordance with the provisions of Division 01.
- B. Indicate where each type of hanger will be used, what piping service, if pipe system will be insulated and with what insulation thickness.
- C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instruction for storage, handling, protection, examination, preparation and installation of product.

PART 2 - PRODUCTS

2.01 HANGERS

- A. Acceptable Manufacturers ; Anvil, Carpenter and Patterson, Fee and Mason, B-Line, Viking, Reliable, and Michigan. Anvil model numbers are used for reference.
- B. Anvil Figure #260 clevis hangers with Figure 167, MSS Type 40 galvanized insulation protection shields (sized for supporting insulation having a compressive strength of 4 psi). Support piping on outside of insulation. Size hangers so that pipe insulation passes through them without interruption.
 1. Domestic hot water piping above 160 degrees F. 4" diameter and less
 2. All other insulated piping
- C. Anvil Figure CT-69, MSS Type 10 with adjustable wrought tubing ring hanger, copper plated for:
 1. Non-insulated copper tubing with no longitudinal movement

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2. Isolation of copper tubing from dissimilar material shall also be accomplished through the use of PHD Manufacturing, Model Numbers 2501 - 2514 Unistrut clamps with PVC inserts or PHD model number 143 PVC coated swivel ring hangers.
- D. Anvil Figure #171, MSS Type 41 with pipe roller, Anvil Figure #167 protection saddle, MSS Type 40 galvanized insulation protection shields (sized for supporting insulation having a compressive strength of 4 psi, at 8 foot intervals). Support piping on outside of insulation. Size hangers so that pipe insulation passes through them without interruption. Use these for:
 1. Domestic hot water above 160 degrees F, 6" diameter and larger.
- E. Anvil Figure #CT-121, MSS Type 8, riser clamps (at floor penetrations) to support:
 1. Copper pipe risers
- F. Anvil Figure #261, MSS Type 8, riser clamps (at floor slab penetrations) to support:
 1. Steel pipe risers
 2. PVC pipe risers
- G. Anvil Powerstrut Trapeze Hangers: Where three or more lines of pipe run parallel, support them with trapeze hangers.
- H. Water piping supports within walls to be by Caddy, Holdrite, Sioux Chief or approved equivalent. Support vertical drops and piping at fixture supplies in wall. Hanger material to be suitable for piping material installed. Piping supports shall be installed per manufacturer's recommendations.

2.02 METAL CHANNEL (STRUT) FRAMING SYSTEMS:

- A. Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field assembly of supports.
- B. Acceptable Manufacturers: Anvil, B-Line, Unistrut, or approved equal.
- C. Furnish channels and associated fittings, accessories, and hardware produced by a single manufacturer.
- D. Comply with MFMA-4.
- E. Material and Dimensions: Galvanized steel; 1-5/8 inch width by 1-5/8 inch height; 14 gauge minimum.

2.03 INSERTS

- A. Concrete Insert: Anvil Figure #281, MSS Type 18, universal concrete inserts, adequately sized and correctly positioned to support full load operating systems.
- B. Concrete Insert, Wedge Type: Anvil Figure #281, 1/4" to 7/8"
- C. Lightweight Concrete Insert: Anvil Figure #285
- D. Continuous Concrete Insert: Anvil Powerstrut Figure #PS-349, pre-galvanized

2.04 EXPANSION ANCHORS

- A. Hilti Kwik-bolt, zinc-plated, metal expansion anchor.
- B. Anchor to meet U.L., ICBO-4627 and FM listings.

2.05 HANGER RODS

- A. Provide mild steel all-thread rods with maximum loads as follows:
 - 1. 3/8" - 300 lbs
 - 2. 1/2" - 600 lbs
 - 3. 5/8" - 1,200 lbs
 - 4. 3/4" - 2,000 lbs
 - 5. 1" - 5,000 lbs

2.06 CLAMPS

- A. C-Clamps: Anvil Figure #92, MSS Type 23.
 - 1. Use these for attaching hangers to steel beams. Do not weld hanger rods to structural steel members.
- B. Malleable Beam Clamps: Anvil Figure #218, MSS Type 30: Use these for attaching hangers to bar joists. Attach clamps to top chord of bar joists only. Confirm with structural engineer for maximum loading and restrictions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as required.
- B. Verify that mounting surfaces are ready to receive support and attachment components.

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- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, evaluation report and conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit or other systems.
- D. Unless specifically indicated or approved by the Architect, do not provide support from suspended ceiling grid support system or ceiling grid.
- E. Do not penetrate or otherwise notch or cut structural members without approval of the Architect and Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Support pipes on specified hangers so that equipment, pumps, and fittings do not bear weight or stresses from vibration and swaying of pipe. Support pipe risers at regular intervals in pipe shafts at least once at each floor level or a maximum of 12'-0" apart. Do not use perforated metal, strap iron, or band iron. Do not make offsets in hangers.
- K. Maximum allowable spacing of pipe hangers is listed below. Space hangers and brackets at closer intervals where necessary to maintain levels, slopes, and drainage, or to prevent sagging or swaying of pipe.
- L. COPPER PIPE - Water

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1. 1/4" to 1-1/4" - 5'0" O.C.
2. 2" to 2-1/2" - 8'0" O.C.
3. 3" and above - 10'0" O.C.

M. CAST IRON PIPE

1. Space hangers not to exceed 5 feet on centers. Provide minimum of two hangers per section within 18" of joint on barrel and at change of direction and branch connection. Install hanger and supports per CISPI 301-12.

END OF SECTION

SECTION 22-0548

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Seismic control requirements.
 - 1. Includes requirements for seismic qualification of equipment not specified in this section.
- C. Equipment support bases and isolation.
- D. Equipment vibration isolators.
- E. Seismic restraint systems.
- F. Piping isolation.

1.02 RELATED REQUIREMENTS

- A. Section 01-4533 - Code-Required Special Inspections and Procedures.
- B. Section 03-3000 - Cast-in-Place Concrete.

1.03 DEFINITIONS

- A. Plumbing Component: Where referenced in this section in regards to seismic controls, applies to any portion of the plumbing system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.
- C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

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- F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- G. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).
- H. MFMA-4 - Metal Framing Standards Publication; 2004.
- I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
- 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
- 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
- 4. Seismic Controls:
 - a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
 - b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
- 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

- 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03-3000.

1.06 SUBMITTALS

- A. Submit product data and drawings for review in accordance with the requirements of Division 01.
- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

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- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 - 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
 - 2. Seismic Controls: Include seismic load capacities.
- D. Shop Drawings - Vibration Isolation Systems:
 - 1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
 - 2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.
- E. Shop Drawings - Seismic Controls:
 - 1. Include dimensioned plan views and sections indicating proposed plumbing component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
 - 2. Identify mounting conditions required for equipment seismic qualification.
 - 3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
 - 4. Indicate proposed arrangement of distributed system trapeze support groupings.
 - 5. Indicate proposed locations for distributed system flexible fittings and/or connections.
 - 6. Indicate locations of seismic separations where applicable.
- F. Seismic Design Data:
 - 1. Compile information on project-specific characteristics of actual installed plumbing components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
 - 2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.
- G. Certification for seismically qualified equipment; identify basis for certification.
- H. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT 22-0548 -4

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- I. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- J. Evidence of qualifications for seismic controls designer.
- K. Evidence of qualifications for manufacturer.
- L. Manufacturer's detailed field testing and inspection procedures.
- M. Field quality control test reports.

1.07 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in State in Which the Project Is Located and with minimum five years experience designing seismic restraints for nonstructural components.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing plumbing equipment and/or plumbing connections to vibration-isolated equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
 - 1. Select vibration isolators to provide required static deflection.
 - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
- D. Equipment Isolation:

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E. Piping Isolation:

1. Provide vibration isolators for piping supports:
 - a. Located in equipment rooms.
 - b. Located within 50 feet (15.2 m) of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.
 - c. For piping over 2 inch (50 mm) located below or within 50 feet (15.2 m) of noise-sensitive areas indicated.
2. Minimum Static Deflection:
 - a. First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch (50 mm) deflection required.
 - b. Remainder of Supports: 0.75 inch (19 mm) deflection unless otherwise indicated.
3. Suspended Piping, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
4. Floor-Mounted Piping, Seismic Applications: Use seismic type restrained spring isolators.

2.02 SEISMIC CONTROL REQUIREMENTS

- A. Design and provide plumbing component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor plumbing components.
- B. Seismic Design Criteria: As indicated on Structural Drawings.
- C. Component Importance Factor (I_p): Plumbing components to be assigned a component importance factor (I_p) of 1.5 unless otherwise indicated.
- D. Seismic Qualification of Equipment:
 1. Provide special certification for plumbing equipment furnished under other sections and assigned a component importance factor (I_p) of 1.5, certifying that equipment will remain operable following a design level earthquake.
 2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.

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3. Notify Architect and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

E. Seismic Restraints:

1. Provide seismic restraints for plumbing components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.

2. Seismic Restraint Exemptions:

a. Exemptions for Seismic Design Category C:

1) Plumbing components where either of the following apply:

- (a) The component importance factor (I_p) is 1.0 and the component is positively attached to the structure.
- (b) The component weighs 20 pounds (89 N) or less or, in the case of a distributed system, 5 pounds per foot (73 N/m) or less.

2) Plumbing piping with component importance factor (I_p) of 1.5 and nominal pipe size of 2 inch (50 mm) or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).

b. Exemptions for Seismic Design Category D, E, and F:

1) Discrete plumbing components that are positively attached to the structure where either of the following apply:

- (a) The component weighs 400 pounds (1,780 N) or less, has a center of mass located 4 feet (1.22 m) or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor (I_p) is 1.0.
- (b) The component weighs 20 pounds (89 N) or less or, in the case of a distributed system, 5 pounds per foot (73 N/m) or less.

2) Plumbing piping with component importance factor (I_p) of 1.0 and nominal pipe size of 3 inch (80 mm) or less, or with component importance factor (I_p) of 1.5 and nominal pipe size of 1 inch (25 mm) or

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less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).

c. Plumbing Piping Exemptions, All Seismic Design Categories:

- 1) Plumbing piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:
 - (a) Trapeze supported piping weighing less than 10 pounds per foot (146 N/m), where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.
 - (b) Trapeze supported piping with trapeze assemblies using 3/8 inch (10 mm) diameter rod hangers not exceeding 12 inches (305 mm) in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (I_p) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds (445 N) or less.
 - (c) Trapeze supported piping with trapeze assemblies using 1/2 inch (13 mm) diameter rod hangers not exceeding 12 inches (305 mm) in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (I_p) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds (890 N) or less.
 - (d) Trapeze supported piping with trapeze assemblies using 1/2 inch (13 mm) diameter rod hangers not exceeding 24 inches (610 mm) in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (I_p) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds (445 N) or less.

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- (e) Hanger supported piping with individual rod hangers 3/8 inch (10 mm) or 1/2 inch (13 mm) in diameter not exceeding 12 inches (305 mm) in length from support point connection to the supporting structure, where pipe has a component importance factor (I_p) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds (220 N) or less.
- 3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
 - a. FEMA 412.
 - b. FEMA 413.
 - c. FEMA 414.
 - d. FEMA E-74.
 - e. SMACNA (SRM).
- 4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
- 5. Seismic Type Vibration Isolators:
 - a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
- 6. External Seismic Snubber Assemblies:
 - a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
 - b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
- 7. Seismic Restraint Systems:
 - a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
 - b. Use only cable restraints to restrain vibration-isolated plumbing components, including distributed systems.

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- c. Use only one restraint system type for a given plumbing component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
- d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain plumbing component in all lateral directions; consider bracket geometry in anchor load calculations.
- e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported plumbing component weight.
- f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported plumbing component weight.
- g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
- h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
- i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

F. Seismic Attachments:

1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.

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6. Concrete Housekeeping Pads:

- a. Increase size of pad as required to comply with anchor requirements.
- b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

G. Seismic Interactions:

1. Include provisions to prevent seismic impact between plumbing components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between plumbing equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

H. Seismic Relative Displacement Provisions:

1. Use suitable fittings or flexible connections to accommodate:
 - a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
 - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
 - c. Design displacements at seismic separations.
 - d. Anticipated drifts between floors.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Manufacturers:

1. Vibration-Isolated Equipment Support Bases:

- a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
- b. Mason Industries; _____: www.mason-ind.com/#sle.

B. Vibration-Isolated Structural Steel Bases:

1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

2.04 VIBRATION ISOLATORS

A. Manufacturers:

1. Vibration Isolators:

- a. Kinetics Noise Control, Inc; _____: www.kineticsnoise.com/#sle.
- b. Mason Industries; _____: www.mason-ind.com/#sle.

B. General Requirements:

- 1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
- 2. Spring Elements for Spring Isolators:
 - a. Color code or otherwise identify springs to indicate load capacity.
 - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
 - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
 - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
 - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
 - f. Selected to function without undue stress or overloading.
- 3. Seismic Snubbing Elements for Seismic Isolators:
 - a. Air Gap: Between 0.125 inches (3 mm) and 0.25 inches (6 mm) unless otherwise indicated.
 - b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch (6 mm) thick; capable of being visually inspected for damage and replaced.

C. Vibration Isolators for Non-seismic Applications:

1. Resilient Material Isolator Pads:

- a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
- b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch (6 mm) thickness.

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- c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
 2. Resilient Material Isolator Mounts, Non-seismic:
 - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
 3. Restrained Spring Isolators, Non-seismic:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
 - b. Bottom Load Plate: Steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
 - d. Provides constant free and operating height.
 4. Combination Resilient Material/Spring Isolator Hangers, Non-seismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
- D. Vibration Isolators for Seismic Applications:
 1. Resilient Material Isolator Mounts, Seismic:
 - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
 2. Restrained Spring Isolators, Seismic:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop;

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specifically designed and rated for seismic applications with integral snubbing in all directions.

- b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
 - d. Provides constant free and operating height.
3. Resilient Material Isolator Hangers, Seismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
4. Spring Isolator Hangers, Seismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
- E. Non-Seismic Type:
1. Type 1 - All Elastomeric-Fiber Glass Pads:
 - a. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with 16 ga. load plate providing evenly distributed load over pad surface.
 - b. Mason Super "W" pad.
 2. Type 2 - Elastomeric Mounts:
 - a. Mason BR.
 3. Type 3 - Steel Springs:
 - a. Assembly: Freestanding, laterally stable without housing, 1/4" neoprene non-skid pad

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- b. Leveling Device: Rigidly connected to equipment or frame, spring diameter no less than 0.8 of compressed height at rated load, minimal additional travel to solid equal to 50% of rated deflection.
 - c. Mason SLF.
4. Type 4 - Restrained Steel Springs:
- a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction, internal isolation pad.
 - b. Mason SLR.
5. Type 13A - Elastomeric Hangers:
- a. Mason 30.
6. Type 13 - Spring Hanger:
- a. Mason HS.
7. Type 6 - Combination Elastomeric-Spring Hanger:
- a. Mason 30N.
8. Type 16 - Thrust Restraints:
- a. Bottom Openings: Sized to allow plus/minus 15 degrees rod misalignment.
 - b. Mason WBI or WBD.
9. Type 12 - Flexible stainless steel braided hose connectors:
- a. 1/2" to 1-1/2": 12" long
 - b. 2" to 4": 18" long
 - c. 6" to 10": 24" long
 - d. 12" to 16": 32" long
 - e. Mason BBS
10. Type 15 - Flexible rubber pipe connections, peroxide cured EPDM with Kevlar tire cored reinforcement, raised face rubber flanges with encased solid steel rings.
- a. 14" diameter and below: Mason SFDEJ twin sphere with reinforcing ring; minimum pressure rating of 250 psi at 170 degrees F and 215 psi at 250 degrees F.

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- b. 16" diameter and above: Mason SFEJ single sphere; minimum pressure rating of 180 psi at 170 degrees F and 150 psi at 250 degrees F.
- c. Control rods: Mason CR with 1/2" thick Neoprene washer bushings.

2.05 ACOUSTICAL AND VIBRATION ISOLATORS

A. General Requirements:

- 1. Acoustical Isolation System: Through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support brackets.

2.06 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:

- 1. Comply with ASCE 19.
- 2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
- 3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
- 4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01-4533 and statement of special inspections as required by applicable building code.
- B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.

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1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
 2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- C. Seismic special inspections include, but are not limited to:
1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with the certificate of compliance.
 2. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units for Seismic Design Categories C, D, E, and F; periodic inspection.
 3. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch (6.4 mm) or less between equipment support frame and seismic restraint; periodic inspection.
 4. Verification of required clearances between plumbing equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.
- D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.
- E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- E. Vibration Isolation Systems:
 1. Vibration-Isolated Equipment Support Bases:

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- a. Provide specified minimum clearance beneath base.
 2. Spring Isolators:
 - a. Position equipment at operating height; provide temporary blocking as required.
 - b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
 - c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
 3. Isolator Hangers:
 - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
 - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
 4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
 5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
 6. Adjust isolators to be free of isolation short circuits during normal operation.
 7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.
- F. Seismic Controls:
1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
 2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
 3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
 4. Equipment with Sheet Metal Housings:
 - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.

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- b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
 - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
- a. Size in accordance with seismic design to meet anchor requirements.
 - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
- a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
 - b. Install restraints within permissible angles in accordance with seismic design.
 - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
 - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
 - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.04 INSTALLATION - GENERAL

- A. Support piping connections to equipment mounted on isolators using isolators or Type 6 resilient hangers for scheduled distance.
- B. Provide Type 12 flexible connections at the following locations:
 - 1. Medical vacuum lines within 50 pipe diameters each side of vacuum pump.
 - 2. Medical air lines within 50 pipe diameters each side of compressors.

3.05 INSTALLATION - SEISMIC

3.06 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Vibration Isolation Systems:

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1. Verify isolator static deflections.
 2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- D. Seismic Controls:
1. Verify snubbing element air gaps.
- E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.07 SCHEDULES

- A. Pipe Isolation Schedule. Use Type 6 vibration isolation on the following piping sizes and locations.
- B. Equipment Isolation Schedule. Use the isolator and restraint types listed above on the following applications.
1. Plumbing Pumps
 - a. Slab on grade: type 15
 - b. Upper floors: type 3, 10, 15
 2. Hot water recirculation pumps
 - a. Suspended: Type 6

END OF SECTION

SECTION 22-0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Installation of all tags, markers and identification for plumbing piping, medical gas piping and equipment.

1.02 RELATED REQUIREMENTS

- A. Section 09-9000 - Painting and Coating: Identification painting.
- B. Section 22-0700 - Plumbing Insulation.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

1.04 SUBMITTALS

- A. Submit product data for review in accordance with the requirements of Division 01.
- B. List: Submit list of wording, symbols, letter size, and color coding for plumbing identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

PART 2 -PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Water Heaters: Nameplates.
- B. Major Control Components: Nameplates.
- C. Domestic Water Piping: Tags.

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- D. Storm, Waste and Vent Piping: Pipe Markers
- E. Other Plumbing Piping: Pipe Markers
- F. Pumps: Nameplates.
- G. Tanks: Nameplates.
- H. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

- A. Acceptable Manufacturers:
 - 1. Seton Identification Products: www.seton.com/#sle.

2.03 TAGS

- A. Acceptable Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
 - 2. Brady Corporation: www.bradycorp.com/#sle.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 4. Seton Identification Products: www.seton.com/#sle.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame. Also provide an Xcel spread sheet of all valves, with location and tag number to owner.

2.04 STENCILS

- A. Acceptable Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com/#sle.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com/#sle.
 - 3. Seton Identification Products: www.seton.com/#sle.
- B. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.

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2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
 3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
 4. Equipment: 2-1/2 inch (65 mm) high letters.
- C. Stencil Paint: As specified in Section 09-9123, semi-gloss enamel, colors complying with ASME A13.1.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prepare surfaces in accordance with Section 09-9123 for stencil painting.
- B. Piping requiring insulation shall be insulated prior to pipe identification being installed.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09-9123.
- D. Install plastic pipe markers in accordance with manufacturer's instructions. Install markers at least once in every room and at no more than 20 foot intervals.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Paint and label piping within each mechanical room, fan room, boiler room and central plant as follows:
 1. Domestic Cold Water: Dark Blue
 2. Domestic Hot Water and Hot Water Return: Rose Red.
- G. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- H. Use tags or pipe markers on piping 3/4 inch (20 mm) diameter and smaller.
 1. Identify service, flow direction, and pressure.
 2. Install in clear view and align with axis of piping.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT 22-0553 -4

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3. Locate identification not to exceed 20 feet (6 m) on straight runs, at least once in every room and including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
 - I. Install equipment with plastic nameplates.
 - J. Locate ceiling tacks to locate valves or equipment above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 22-0700
PLUMBING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Insulation of plumbing piping
- B. Insulation of plumbing equipment

1.02 RELATED REQUIREMENTS

- A. Section 23-0700 - HVAC Insulation

1.03 DEFINITIONS

- A. Exposed - Equipment and piping in areas which will be visible without removing ceilings or opening access panels.
- B. Concealed - Installed above ceiling, in walls or chases.
- C. Outdoors - Exposed to the weather or ambient conditions.
- D. Underground - Buried.

1.04 SUBMITTALS

- A. Submit manufacturer's product data and installation procedures for review in accordance with the requirements of Division 01.

1.05 QUALITY ASSURANCE

- A. Insulation, adhesives, coatings, sealers, jackets and tapes shall have a flame spread rating of 25 or less and smoke development of 50 or less in accordance with ASTM E-84 and UL 723.
- B. Materials shall meet the requirements of NFPA 90A.
- C. Manufacturer qualifications: ISO 9001-2000 Certified specializing in manufacturing the products specified in this section.
- D. Applicator qualifications: Company specializing in the installation of the specified products and the work required to install the products with not less than 5 years experience.

PART 2 - PRODUCTS

2.01 PIPE AND EQUIPMENT INSULATION

- A. Materials for Pipe and Equipment: Provide factory premolded insulation for pipe, pipe fittings, and valves.
- B. Fitting insulation: Same thickness and material as adjoining pipe insulation.
- C. Flexible Tubular Elastomeric:
 - 1. Provide fire-retardant closed-cell slip-on flexible type; with a "K" value of 0.245 BTU-in/hr-ft²-degree F at 75 degrees F.
 - 2. Acceptable manufacturers: Armacell AP Armaflex; K-Flex USA Insul-Tube; Aeroflex Aerocell.
 - 3. Use on the following services:
 - a. Moisture condensate drains - 1/2" thick
 - b. Drain bodies, traps and horizontal drain lines receiving cold condensate - 1/2" thick
- D. Fiberglass Pipe Insulation:
 - 1. Acceptable manufacturers: Johns-Manville "Micro-Lok HP"; CertainTeed; Knauf; Owens Corning, Foster. Jacket: ASJ fiberglass reinforced Kraft paper with aluminum foil; minimum R value of 3.7 per inch of thickness.
 - 2. Use on the following services:
 - a. Domestic hot water supply piping (105 to 140 degrees F) - 1-1/4" and smaller-- 1" thick; 1-1/2" and larger--1-1/2" thick.
 - b. Domestic hot water piping (141 to 200 degrees F) - 1-1/4" and smaller--1-1/2" thick; 1-1/2" and larger - 2" thick.
 - c. Domestic hot water recirculation piping - 1" thick up to 1-1/4" pipe size; 1-1/2" thick on pipe sizes 1-1/2" and larger; 1-1/2" thick on 140 degree F systems up to 1-1/4" pipe size and 2" thick on piping 1-1/2" and larger.
 - d. Domestic cold water piping indoors - 1/2" thick.
 - e. Domestic water piping in exterior walls - 1" thick.
- E. Fiberglass Equipment insulation:
 - 1. Acceptable Manufacturers: Johns-Manville; Certainteed; Knauf; Owens Corning, Foster.

2. Apply to equipment as directed by the manufacturer.
3. Install rigid or flexible insulation, 2" minimum thickness with 'K' value of 0.27 at 75 degrees F with a maximum service temperature of 850 degrees F. (1200 degrees F for engine exhaust insulation).
4. Provide vapor barrier as required when the liquid temperature is below 65 degrees F.

2.02 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

- A. For all services, use premolded insulation for pipe fittings, elbows, tees, and couplings 2-1/2 and larger. Finish shall be as specified under Products above or as specified below. PVC fitting covers with full thickness fiberglass inserts may be used on piping fittings elbows and valves 2" and less for the following services:
 1. Domestic Cold Water
 2. Domestic Hot Water
 3. Domestic Hot Water Recirc.
- B. For piping installed above grade exposed-to-the-weather outside the building, cover straight pipe insulation with 0.016" thick aluminum jacket equivalent to Childers and cover fittings with factory formed covers equivalent to Elljacs.
- C. Elastomeric adhesives and finishing:
 1. Adhesive shall be the insulation manufacturer's recommended contact adhesive, Armaflex 520, Armaflex 520BLV or equivalent.
 2. Insulation finish shall be the insulation manufacturer's recommended finish--WB Armaflex finish and shall be paintable.
 3. Accessories such as adhesives, mastics and cements shall have the same properties as listed above and not detract from any of the system ratings as specified.
 4. Where exposed to view inside buildings, the painted finish color shall be as selected by the Architect.

2.03 JACKETS

- A. Canvas Jacket: UL listed 6oz/sq. yd. plain weave cotton fabric treated with dilute fire retardant lagging adhesive compatible with insulation.
- B. Aluminum Jacket: ASTM B209 formed aluminum sheet of 0.016 inch, smooth finish with longitudinal slip joints and 2" laps, 0.016" thick die shaped fittings with factory attached protective liner. Adhere with 3/8" wide aluminum bands.

- C. PVC Jacket: One piece molded type fitting covers and sheet material, off-white in color, 15 mil thickness, 0.002 perm inch maximum in accordance with ASTM E96. Adhere with pressure sensitive color matching vinyl tape.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Deliver and store insulation materials in manufacturer's containers and keep free from dirt, water, chemical and mechanical damage.
- B. Complete piping pressure testing prior to applying insulation.
- C. Apply insulation in workmanlike manner by experienced and qualified workmen.
- D. Surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and before and during application of any finish, unless such finish requires specifically a wetted surface for application.
- E. Adhesives, cements and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state..

3.02 FLEXIBLE SHEET ELASTOMERIC INSULATION

- A. Prior to application of flexible sheet elastomeric insulation, thoroughly clean all metal surfaces, making sure that all dirt, scale, loose paint, plaster, and oil has been removed and that surfaces are dry. If surface has been primed, test a two square foot section using adhesive equivalent to Armaflex 520 in order to determine whether solvent in adhesive will loosen or lift the primer. If primer is loosened, then remove it. When testing proves acceptable, adhere insulation with smooth side out, using thin but adequate coating of same adhesive. Follow manufacturer's instructions. Coat all butt edges of each sheet. Stagger all joints. Insulate all standing seams or flanges with same thickness of insulation material as that used on main surface.

3.03 INSTALLATION OF PIPE AND EQUIPMENT COVERING

- A. Where glass fiber or flexible tubular elastomeric insulation is used on piping sized 2" and larger, insert a section of foamglass or calcium silicate insulation, at hanger or support points, between pipe and metal shield for full length of shield, to prevent crushing of insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. Insulation thickness to be same as adjoining glass fiber insulation. On cold pipe, vapor barrier should be carried through the hanger and sealed. Saddles shall be used where rigid foamglass inserts are not acceptable.
- B. Pipe exposed in mechanical equipment rooms within 8 feet of the finished floor: Finish with canvas jacket ready for finish painting.

- C. Install equipment insulation in accordance with manufacturer's requirements and OSHA requirements.
- D. Apply foamglass insulation as follows:
 - 1. Both the circumferential and longitudinal joints shall be buttered with fire-resistive pliable sealer. Voids and cracks shall be filled with sealer. Apply appropriate mastic as specified under Part 2 - Products. Secure insulation with 3/4" wide x 0.010" thick aluminum bands on 8" centers.
 - 2. The circumferential joints shall be staggered.
 - 3. Fittings, valves, flanges, traps, and air vents shall be insulated with the same thickness of insulation using factory fabricated fitting sections or pre-molded insulated fittings.
 - 4. Block type insulation shall be adhered by stick-clips or bands, in addition to the sealer, as required to provide support for the insulation.
 - 5. Finish above furred ceilings and in chases shall be the bare insulation.
 - 6. Finish in equipment rooms and elsewhere where exposed-to-view shall be White ASJ jacket.
 - 7. Finish on underground insulation shall be Pittsburgh Corning Pittwrap as recommended by manufacturer.
- E. Finish on all piping exposed-to-the-weather shall be 0.016 inch thick, Childers, or equal, aluminum jacket on lines and Elljacs, or equal, pre-formed aluminum covering on fittings.

END OF SECTION

**SECTION 22-1116
DOMESTIC WATER PIPING**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piping and pipe fittings for domestic cold, hot and recirculating water piping.

1.02 RELATED REQUIREMENTS

- A. Section 22-0500 - Common Work Results For Plumbing
- B. Section 22-0553 - Identification for Plumbing Piping and Equipment
- C. Section 22-1119 - Domestic Water Piping Specialties

1.03 SUBMITTALS

- A. Submit product data for review on piping and fittings in accordance with the requirements of Division 01. Submittal data shall include:
 - 1. Manufacturer of pipe.
 - 2. Tests or listings by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
 - 3. Product data for pipe and fittings to be used on each piping system.
 - 4. Solder and brazing product data and installation procedures for copper pipe.
 - 5. Pressed pipe and fitting installation methods and instructions for copper pipe.

1.04 QUALITY ASSURANCE

- A. Lead Free: All wetted surface of pipe, fittings and fixtures in potable water systems shall have a weighted average lead content equal to or less than 0.25% per the Safe Drinking Water Act (Section 1417) as amended January 4, 2011.
- B. NSF Compliance: NSF/ANSI 61, NSF 61-G and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.
- C. Identify pipe with marking including size, ASTM material classification and specification and water pressure rating.
- D. Compliance with ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- E. Compliance with ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

- F. Compliance with ASME B16.51 - Copper and Copper Press-Connect Pressure Fittings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of the completed system.

1.06 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.01 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: Ductile or gray iron, standard thickness.
 - 2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch (19 mm) diameter rods.

2.02 DOMESTIC WATER PIPING, ABOVE GRADE

A. COPPER PIPE, FITTINGS AND JOINTS

- 1. PIPE: Conform to ASTM B-88 specification for wrought seamless copper.
 - a. Type L, hard for:
 - 1) Domestic cold water piping
 - 2) Domestic hot water
 - 3) Domestic hot water recirculating piping
 - b. Use Type K, rolled, soft for: Piping installed under floor slabs.

B. COPPER PIPE FITTINGS AND COUPLINGS

- 1. Sweat type, wrought copper Fittings, ASTM B62, with dimensions conforming to ANSI B16.22 and sweep patterns for copper tubing.
- 2. Grooved-End Copper Fittings: Fittings shall be manufactured to copper tubing sizes, with grooves designed to accept grooved end couplings of the same manufacturer. Fittings shall be wrought copper, conforming to ASTM B-75 alloy

C12200 or ASTM B-152 alloy C11000 and ANSI B16.22, or bronze sand casting ANSI B16.18 and UNS-C89836. Victaulic or Gruvlok Copper Connection Fittings.

3. Pressed Copper Fittings: Wrought copper, ASTM B88, conforming to ASME B16.51, NSF 61 and NSF 61-G and/or NSF 372 with dimensions conforming to ANSI B16.22 or B16.18. Pressed copper fittings 1/2" through 4" shall be suitable for use with ASTM B88 copper tube Type K, L, or M and 1/2" up to and including 1-1/4" annealed copper tube. Pressed copper fittings shall have an EPDM sealing element conforming to IAPMO PS 117 performance criteria and shall have a Smart Connect feature. Sizes 2-1/2" through 4" shall have a 420 stainless steel grip ring, PBT separator ring, EPDM sealing element and Smart Connect feature. Viega Pro-press or equal.

4. Couplings

- a. Mechanical Couplings: Roll groove rigid type
- b. Couplings for Copper Grooved Tube: 2"-8" diameter. Installation ready rigid coupling for direct stab installation without field disassembly.
 - 1) Victaulic Style 607 coupling and Style 641 Flange adapter, consisting of ductile iron cast housings, complete with a synthetic rubber gasket of a pressure-responsive design, with plated nuts and bolts to secure unit together. Couplings shall be manufactured to connect copper tubing sized tube and fittings. (Flaring of tube and fitting ends to IPS dimensions is not allowed.)
 - (a) Coupling Housings: Ductile iron conforming to ASTM A-536, Grade 65-45-12, coated with copper colored alkyd enamel. Housings cast with offsetting, angle-pattern bolt pads to provide rigidity.
 - (b) Coupling Gaskets: Gasket shall be Grade "P" Fluoroelastomer compound with red and blue color code designed for operating temperatures from 0 deg F to +180 deg F.
 - 2) Gruvlok Fig. 6400 Rigid Coupling and Fig. 6084 coupling flange adapters. The Grade "E" EPDM gasket for the Gruvlok Copper Method covers a service temperature range from -40 degrees F to +190 degrees F. Use "Gruvlok Xtreme Lubricant" only. Coupling working pressure is 300 psig maximum.

All Gruvlok coupling gaskets except DRI-SEAL must be lubricated with approved lubricant as provided by Gruvlok. Gruvlok Xtreme Lubricant is strongly recommended below -20 degrees F, and above 180 degrees F and systems subject to continuous cycle temperature changes. Standard and other specific Gruvlok lubricants can be used on other applications as recommended by Gruvlok.

C. DIELECTRIC CONNECTIONS:

1. Provide at junction of copper pipe and equipment with steel piping systems within the temperature limitations of the product.
2. Dielectric insulating flange connections, as manufactured by CTS Fabrication USA, or George Fischer Central Plastics, (1-1/2" thru 8"). Provide bolt insulating sleeves and washers as required.
 - a. Flanges shall be drilled to ASME B16.5, 150 Standard, powder coated with an EPDM insulator adhered to the plate steel protruding inside to prevent contact with the copper companion flange adapter. The copper component of the flange adapter shall be manufactured to ASME B16.22.
3. Provide Watts LF3001A series Lead Free dielectric unions, 1/2" through 1-1/4" and shall consist of a union nut, two tailpieces and an insulating gasket that separates the tailpieces to prevent an electric current from occurring between the dissimilar materials.
4. Provide Dielectric transition fittings, Victaulic Series 647 for sizes 1/2" to 4".
5. Brass fittings and valves shall not be used for dielectric union locations.
6. UNIONS: Brass ground joint, 250 lb. working pressure.
7. Nipples: Brass.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Clean inside of pipe before installation. Keep installed piping clean, and protect ends from foreign matter by capping or plugging them.
- C. Install pipe so that it does not interfere with opening of doors or apparatus, access to equipment, or to electrical equipment.
- D. Do not install pipes in such a way that they will apply torque to pumps. After pumps have been installed and pumps have been operated, recheck and realign pumps if necessary.
- E. Run pipes in straight lines and square with building. Install risers plumb. Make offsets only where indicated and where necessary.
- F. Install branch connections using separate tee or lateral fittings for each branch. Do not combine branches into "bullhead tee" arrangement.

- G. Do not install water pipes in electric rooms, tele/data rooms, transformer rooms, audio/visual rooms or elevator equipment rooms. Fire protection piping runouts serving only these rooms shall be installed in these rooms.
- H. Do not install piping above electrical equipment such as starters, panels, variable frequency motor controllers, motor control centers, or disconnects. Maintain code required clearance above, below and to sides of electrical equipment.
- I. Provide flanges or unions throughout the pipe systems at all equipment. Make provisions for servicing and removal of equipment without dismantling piping.
- J. Piping Expansion:
 - 1. Install piping to allow thermal expansion and contraction without injury to piping, equipment or structure.
 - a. Use loops or expansion joints where necessary and where detailed. See Section 22-0548.
 - b. Provide pipe guides
- K. Branch Lines:
 - 1. Where possible branch lines shall come off top of mains to prevent sediment, welding slag, or pipe deburrs from entering the branch lines and causing valve leakage or failure.
- L. Identify piping and systems in accordance with Section 22 05 53.

3.02 PIPE JOINTING

- A. Preparing Pipe Ends:
 - 1. Machine cut pipe ends square
 - 2. Ream pipe ends, after cutting, to full diameter
- B. Grooved Coupling Installation:
 - 1. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing.
 - 2. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified.
 - 3. All grooved components (couplings, fittings, valves, gaskets, bolts and nuts) shall be of one manufacturer.
- C. Soldered and Brazed Joints:

1. Make Type L copper pipe joints with suitable flux and 95/5, lead free solder.
2. Make Type K copper pipe joints with silver (BAg series) brazing filler material with flux or copper-phos (BCuP series) brazing filler material without flux per the recommendations of the Copper Development Association.
3. Domestic cold and hot water piping 4" and larger shall be brazed. Copper to copper joints shall be brazed using a copper-phosphorus or copper-phosphorus-silver brazing filler metal (BCuP Series) without flux. Dissimilar metals such as copper and bronze or brass shall be brazed using an appropriate flux with a silver (BAg Series) brazing filler metal.
 - a. In lieu of brazing, domestic cold and hot water piping 4" and larger may be joined with rolled grooved copper fittings and valves by Victaulic or Anvil, copper pipe grooved systems.

D. Pressed Copper Fittings:

1. Press copper fittings shall be made in accordance with the manufacturer's most current installation instructions. Tube ends shall be cut on a right angle (square) to the tube. Tube ends shall be reamed and chamfered; all grease, oil and dirt removed from the tube end with a clean rag. The tubing shall be fully examined to ensure there is no damage. Fully insert the tube into the fitting and mark the tubing at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting prior to pressing the joint. The joints shall be pressed using Rigid Pressed Copper tools or other tool(s) approved by the manufacturer. Fitting shall have a 5 year warranty that the system shall be free of failure from manufacturing defects.
2. Installers shall attend a Pressed Copper installation training class from the manufacturer prior to any installation. Records of the installers training shall be maintained at the job site.
3. For sizes 2-1/2" to 4", the installer shall ensure that the stainless steel grip ring is in place.

3.03 ESCUTCHEONS

- A. Provide chrome plated escutcheons where uninsulated pipes penetrate walls or ceilings of finished spaces.

3.04 STRAINERS

- A. Install strainers so the strainer basket can be removed without spilling water on motors and electrical equipment.

3.05 VALVE ACCESS

- A. Locate ceiling/wall access panels at shut-off and control valves for proper access and operation. Furnish and install access doors in accordance with Section 22-0500 and other Divisions as applicable.

3.06 TESTING

- A. Before piping is concealed or insulated, recheck it for leaks.
- B. Rework or replace defective and leaking joints, and joints which are otherwise unsatisfactory. Peening, caulking, and doping are not permitted.

END OF SECTION

SECTION 22-1119
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section includes requirements for:
 - 1. Shock arrestors.
 - 2. Thermometers and pressure gauges.
 - 3. Domestic Water expansion tank
 - 4. Thermostatic balance valve

1.02 RELATED REQUIREMENTS

- A. Section 22-0500 - Common Work Results For Plumbing
- B. Section 22-0523 - Valves For Plumbing Piping
- C. Section 22-0700 - Plumbing Insulation

1.03 QUALITY ASSURANCE

- A. Lead Free: All wetted surface of pipe, fittings and fixtures in potable water systems shall have a weighted average lead content equal to or less than 0.25% per the Safe Drinking Water Act (Section 1417) as amended January 4, 2011.
- B. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.

1.04 SUBMITTALS

- A. Submit product data for review in accordance with the requirements of Division 01.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 BACKFLOW PREVENTERS

- A. Acceptable manufacturers:
 - 1. Beeco
 - 2. Apollo

3. Febco
 4. Cla-Val
 5. Ames
 6. Watts
 7. Wilkins Regulator Company
- B. Provide completely automatic unit, fitted with tight closing shut-off valves and test cocks at each end.
- C. Construct such that all parts are replaceable without removing unit from line.
- D. Provide per local requirements and dimensions as detailed on drawings.

2.03 SHOCK ARRESTORS

- A. Acceptable manufacturers:
1. Josam
 2. Wade
 3. Jay R. Smith
 4. Precision Products
 5. Zurn
 6. Sioux Chief
- B. Arrestor shall be piston type, polycarbonate with two EPDM O-rings, lubricated with FDA-approved Dow Corning #111 silicone compound in Type L or K copper body, suitable for 200 psig minimum pressure at 200 degrees F.
- C. Arrestor shall be ANSI/ASSE 1010 Certified and be maintenance free with no access panel required.

2.04 THERMOMETERS AND PRESSURE GAUGES

- A. Acceptable manufacturers: Trerice, Winters, Dwyer or approved equal.
- B. Thermometers shall have a 9" aluminum case with 3.5" or 6" stem, fully adjustable, organic filled (non-mercury), +/- 1% accuracy, lead free brass or stainless steel thermowell, dual scale, 30 degrees F to 200 degrees F range.

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- C. Pressure gauges shall have a 4" white aluminum dial with type 304 SS case, lead free brass socket, glycerin filled with accuracy of +/- 1.5 % of full scale to 150 degrees F; dry type to 200 degrees F. Install with lead free gauge cock.

2.05 CIRCUIT SOLVER BALANCE VALVE

- A. Valve: Self contained fully automatic thermostatic balance valve as manufactured by ThermOmegaTech, Inc., or equivalent.
- B. Operation: Regulate the flow of recirculated domestic hot water based on water temperature entering the valve assembly independent of the system operating pressure.
 - 1. Valve shall maintain flow even when set point is reached.
 - 2. Factory adjustable for the set point conditions.
- C. Construction:
 - 1. Type 303 Stainless Steel with tapered female NPT pipe threads, rated for 200 psig maximum working pressure at 250 degrees F working temperature.
 - 2. Lead Free components and materials meeting NSF 61 requirements.
 - 3. Spring loaded thermal actuator, self-cleaning.
- D. Installation: Install where shown on the drawings with a full port lead free ball valve on the inlet and outlet of the device. Factory set with required temperature set point.

2.06 DOMESTIC WATER EXPANSION TANK

- A. Acceptable Manufacturers:
 - 1. Amtrol Inc. - THERM-X-TROL
 - 2. Bell and Gossett Series PT
 - 3. Taco PAX Series
 - 4. Watts PLT Series
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1; rated for working pressure of 150 psig at 200 degrees F; stainless steel connectors; polypropylene liner; flexible FDA approved butyl/EPDM diaphragm or butyl bladder sealed into the tank; with steel legs, stand or saddles. Tank shall meet the requirements of NSF 61 for Lead Free construction and use. Designed for use in potable water systems.

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- C. Accessories: Pressure gauge, air charging fitting and tank drain fitting. Precharge to 40 psig.
- D. Capacity: As noted on the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION AND TESTING

- A. Shock Arrestors:
 - 1. Install shock arrestors at each quick closing valve, solenoid type valve, and flush valve. Size shock arrestors in accordance with manufacturer's instructions.
 - 2. Install shock arrestors within five feet of valve, provide wall access panel as required.
 - 3. Test and certify shock arrestors by Plumbing and Drainage Institute in accordance with ANSI/ASSE 1010.
- B. Expansion tanks:
 - 1. Install in locations shown on the drawings and in accordance with the details and manufacturer's requirements.

END OF SECTION

SECTION 22-1120
FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Natural gas piping
- B. Natural gas valves
- C. Natural gas pressure regulators

1.02 RELATED REQUIREMENTS

- A. Section 22 05 00 - Common Work Results for Plumbing
- B. Section 22 05 29 - Hangers for Plumbing Piping

1.03 REFERENCE STANDARDS

- A. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.
- B. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2011 (ANSI/ASME B31.9).
- C. NFPA 54 / ANSI Z223.1 - National Fuel Gas Code; National Fire Protection Association; 2015.

1.04 SUBMITTALS

- A. Submit product data for review in accordance with the provisions of Division 01 for piping, fittings, valves, and coatings. Submittal data shall include but not be limited to:
 - 1. Manufacturer of pipe.
 - 2. Tests or listing by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
 - 3. Product data for piping, fittings, valves and coatings.
 - 4. Welding procedures for steel pipe.
 - 5. Heat fusion jointing methods.

1.05 QUALITY ASSURANCE

- A. Material standards: Applicable ASTM standards for material requirements.
- B. Dimensional standard: ANSI B36.10, latest edition.

- C. Screw threads: American Pipe Thread Standards.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Pipe: Schedule 40 black steel ASTM A 53 seamless or continuous weld.
 - 1. Use exposed above ground or within buildings.
 - 2. Use underground with exterior coating as specified herein.
- B. Medium-Density Polyethylene (MDPE) Yellow Gas Pipe
 - 1. Acceptable manufacturer: JM Eagle or equal.
 - 2. Sizes: 1/2" through 12"
 - 3. Compliance: meets ASTM D2513, Standard for Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
 - 4. Jointing method: Heat fusion jointing by socket fusion or butt fusion.
 - 5. Weather resistance: Provide pipe with UV stabilizer to protect from UV degradation when exposed to direct sunlight for a minimum of 3 years.
 - 6. Use for underground natural gas service only.
- C. Fittings:
 - 1. Welded fittings: Factory made fittings, full line size for all branches, elbow, or tee. Use reducers after fittings if dictated by branch pipe size.
 - 2. Screw fittings: Grinnell or approved equal, Class 150, malleable iron.
 - a. Joint compound: LACO, Rector-Seal, or WKM Key-Tite.
 - 3. Press Fittings: Viega MegaPress G Black steel Press-Connect or equal mechanical joint fittings for black steel pipe
 - a. Sizes: 1/2" to 2", listed to ANSI LC-4
 - b. Operating Pressure: 125 psi maximum
 - c. Operating Temperature: 0 degrees F to 180 degrees F
 - d. Sealing Element: HNBR
 - e. Leakage Path Connection Feature: Provide factory design of leakage path for unpressed fittings and Color-coded markings on exterior of fitting for readily identifying/inspecting sealing element type.

- f. Installation: Install in accordance with the manufacturer's written instructions using only tools approved by the fitting manufacturer.

D. Valves:

- 1. 2" and smaller: AGA or UL approved
- 2. 2-1/2" and larger: Certified by the manufacturer for natural gas service
- 3. Provide valves with handle
- 4. Valves shall be acceptable to local authorities

E. Exterior coating: Republic Steel Corporation's X-Tru-Coat high density polyethylene extruded coating.

F. Lubricated Plug Cocks:

- 1. For valves 2" and less, iron body, threaded, Nordstrom Figure No. 114.
- 2. For valves 2-1/2" to 4", iron body, flanged, Class 125, Nordstrom Figure No. 115.
- 3. Provide visual position indicators on all plug cocks.
- 4. All valves shall be AGA approved for natural gas service.

G. Valve Connections: Two inches and smaller - threaded; 2-1/2 inches and larger - flanged.

H. Strainers:

- 1. Acceptable Manufacturers: Armstrong International; Green Country Filter Manufacturing; WEAMCO.
- 2. Sizes 2" and smaller: Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- 3. Sizes 2-1/2" and larger: Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

I. Gas Pressure Regulator Valves:

- 1. Gas pressure regulator valves shall meet ANSI Z21.80a, CSA 6.22a-2005 as manufactured by Pietro Fiorentini, Fisher, Maxitrol, or approved equal.
- 2. Gas regulators for use in systems at 5 psi and 2 psi shall be provided with an AGA approved automatic vent limiting device for indoor use only.
- 3. All pressure regulators installed in systems that operate above 5 psi shall have a vent piped in accordance with Government and local codes and regulations to the

exterior of the building. Provide vent protectors for outdoor applications to protect vents from foreign particles, insects, dust, rain or snow.

4. See drawings, installation section and schedules for location and sizes of gas pressure regulator valves and vent routing.

J. Roof Top Support Mounting Blocks:

1. Roof top supports for mounting natural gas piping by B-Line, Durablok, Miro, or Roof Top Blox. Wood blocking shall not be used. Material to be UV and weather resistant
2. Connect piping to support blocking or stands per manufacturers specifications and spacing requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Jointing: All welded construction, except where required for servicing and for sizes 4" and smaller as specified herein.
- B. Screwed fittings:
 1. May be used in lieu of welded joints for sizes 4" and smaller when pressure is 5 psi or less.
 2. Install screwed joints to be accessible for repair.
 3. Do not install screwed fittings in furred ceilings or chases.
- C. Provide a gas valve at each piece of equipment and where indicated on drawings.
- D. Pipe vents from each natural gas pressure regulator independently to the exterior of the building. Vent sizes shall be connection size and as recommended by the regulator and equipment manufacturer.
- E. Underground gas piping shall be of the same metals and meet the same working pressure requirements specified herein, except that it shall be coated and protected as follows:
 1. Coat exterior surface of underground gas pipe with high density polyethylene extruded coating.
 2. The protective coating shall be factory applied with a fluid mastic undercoat. The polyethylene coating shall be minimum of 0.040 inches thick.
 3. Field welds, joints and fittings shall be protected with mastic undercoat and by wrapping with at least two (2) layers (half lap) of "X-Tru-Tape" installed as

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recommended by the manufacturer or with Raychem “Thermofit” heat shrinkable pipe sleeves applied as recommended by the manufacturer.

- F. Cathodic Protection: All underground steel and steel tubing gas piping shall be provided with a cathodic protection system per NFPA 54; Chapter 7.1.3, Corrosion Protection of Piping.
- G. Concealed piping: Where indicated on drawings or when required by local code authorities, provide an A-53 Schedule 10 black steel pipe sleeve to completely enclose the gas pipe through all chases and concealed areas of the building . Vent sleeve to atmosphere at the top of the building.
- H. Underground piping: Before backfilling, electrically test all underground piping, fittings, joints and valves for location of possible defects in the protective coating. Cover breaks in the coating with The Tapecoat Company, Inc., “Tapecoat SP” or equal. Apply Tapecoat in accordance with manufacturer's instructions.
- I. Underground MDPE piping shall be properly and continuously bedded and installed in accordance with the manufacturer's written installation instructions. Piping shall be allowed to contract while cooling prior to backfill.
 - 1. Provide pipe locator tracer wire a minimum of 12" above the piping during backfill so pipe can be properly located after installation.
 - 2. All piping and joints shall be tested for a leak free installation prior to covering or backfill.

END OF SECTION

**SECTION 22-1123
DOMESTIC WATER PUMPS**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Domestic Water Booster Pumps

1.02 RELATED REQUIREMENTS

- A. Section 22-1116 - Domestic Water Piping
- B. Section 22-0523 - Valves For Plumbing Piping
- C. Section 22-0553 - Identification for Plumbing Piping and Equipment
- D. Division 26: Electrical

1.03 SUBMITTALS

- A. Submit certified product data for review in accordance with the requirements of Division 01.
- B. Submit certified pump curves showing operating points, capacity, wiring diagrams and operating instructions. Include NPSH curves and operating sequences when applicable.

1.04 QUALITY ASSURANCE

- A. Identification: Provide pumps with manufacturer's name, model number, rating and capacity identified by a permanently attached label.
- B. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25% of mid-point of published maximum efficiency curve.
- C. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this sections with a minimum of 5 years experience.
- D. Pumps shall meet all ASHRAE 90.1 requirements and have programmed logic to reduce flow based on system pressure sensors to reduce pump speed and flow during periods of minimum use.
- E. Pumps and control systems shall have control logic to shut pumps off during periods of no flow or use and be able to restart when flow is needed to maintain minimum pressure in accordance with the requirements of ASHRAE 90.1.

PART 2 - PRODUCTS

2.01 DOMESTIC WATER BOOSTER PUMPS (VARIABLE SPEED)

- A. Acceptable Manufacturers: Bell & Gossett, Canaris, Synchroflo, Taco, or Wilo
- B. Provide the number of pumps scheduled and a hydro pneumatic tank to automatically maintain system pressure even during low and no flow conditions.
- C. The pump system shall be completely factory tested and fabricated on a steel skid including pumps, motors, valves, type "L" copper or type 304 stainless steel suction and discharge manifolds, all interconnecting piping, wiring and controls. Provide isolation valves, non-rising stem gate or wafer style butterfly, on the suction and discharge of each pump. Also provide factory furnished variable speed drives and control panel. All skid-mounted components shall be capable of being serviced with the booster system in operation. The complete pump package shall be factory finished with baked enamel paint.
- D. Pumps shall be end suction or vertical centrifugal type with ANSI flanged connections. Pump features to include foot supported casing, back pull out design, top centerline discharge with replaceable casing wear rings and hydraulically balanced impeller. The pump shall be bronze or stainless steel fitted suitable for domestic water service with a replaceable shaft sleeve and mechanical seal suitable for a working pressure of 175 PSIG.
- E. Motors shall be manufactured to NEMA Standards furnished in an open drip-proof or totally enclosed fan cooled configuration. Motors shall have an AEGIS shaft grounding ring for each motor controlled with a VFD. Motors shall be rated to have a 1.15 service factor.
- F. Pump operating and sequence controls shall include alternating lead pump operation for all pumps of same capacity, constant speed bypass features (all pumps), adjustable pressure switches to sequence each pump on and vortex shedding flow sensors to sequence each pump off.
- G. Variable Frequency Motor Controllers
 - 1. Receive, mount and wire variable frequency motor controllers which are specified in Division 26. Factory installed VFDs shall meet the requirements of VFD specifications in Division 26.
- H. Hydro Pneumatic Tank shall be constructed in accordance with Section VIII of the ASME code rated for 200 PSIG and be N.B stamped. The tank shall be carbon steel construction with an F.D.A. approved replaceable liner to prevent water from coming in contact with the metal shell. The tank shall include an air fill valve, pressure gauge and bottom system connection suitable for 100% draw down.

- I. Control Panel shall include a U.L. listed enclosed (NEMA 1) industrial control panel factory mounted and wired on the steel skid. The panel shall be furnished with programmable microprocessor based controller, main disconnect with external handle, external door mounted 4-1/2 inch suction and discharge pressure gauges, 115 and 24 volt fused control circuit transformers, current/voltage proportional D.C. input(s) and output(s), pump operation status for interface with building automation system (BAS), pump operation and sequence controls, terminal block for sensor connections, control panel (on-off) switch and light, pump running lights, key pad entry, H.O.A. selector switches, pump minimum run timers, alpha numeric display, controller diagnostics, P.I.D. algorithmic controls, data security, motor overload indicating light with auto-start next pump, low suction pressure shutdown circuit with auto reset and light, audible alarm with silence pushbutton, auto alternation for pumps and individual pump temperature probes and purge valves.
- J. Factory Testing to include, as a minimum, hydrostatic testing as well as undergo a complete electric and hydraulic test from 0 to 100% design flow at the factory. All control, pump sequencing devices, alarms and instrumentation shall be tested and calibrated for proper operation during the factory-testing period.
- K. Start-up Service shall include participation of an authorized factory representative during start-up of the system at the project location and operating instruction for the Owner's operational personnel.
- L. Warranty shall include protection against defects in materials or factory workmanship under normal use and service for a period of one year after date of start-up and original operation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify location and clearance requirements.
- B. Install in accordance with manufacturer's recommendations and as shown and detailed on the drawings.
- C. Domestic water booster pumps:
 - 1. Provide factory representative or manufacturer's service representative to verify proper installation, operation and performance as specified.
 - 2. Test controls and operating status, contacts and verify operation.
- D. Install booster pumps on vibration isolation pads when installed on slab on grade or on inertia bases when above slab on grade.
- E. Provide flexible connections at piping connections to pumps and/or header.

3.02 START-UP AND TEST

- A. Start-up pump, verify integrity of connection and electrical phasing.
- B. Test pumps in operation under design load conditions.
- C. Coordinate with Section 23-0593 - Testing, Adjusting, and Balancing for HVAC for test and balance requirements.
- D. Test pumps and system controls to meet ASHRAE 90.1 requirements.

END OF SECTION

SECTION 22-1316
STORM AND SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sanitary waste and vent piping

1.02 RELATED REQUIREMENTS

- A. Section 22 05 00 - Common Work Results For Plumbing
- B. Section 22 05 29 - Hangers for Plumbing Piping
- C. Section 22 13 19 - Sanitary Waste Piping Specialties

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- B. ASTM C 1540 - Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings
- C. ASTM A-74 - Standard Specification for Cast Iron Soil Pipe and Fittings
- D. ASTM A-888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
- E. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary
- F. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
- G. UL 723 - Tests for Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

- A. Submit product data for review on piping and fittings in accordance with the requirements of Division 01. Submittal data shall include:
 - 1. Manufacturer of pipe.
 - 2. Tests or listing by recognized testing laboratory that certifies material composition is in accordance with ANSI/ASTM requirements.
 - 3. Product data for pipe and fittings to be used on each piping system.

4. Identification of where each pipe type will be used.

1.05 QUALITY ASSURANCE

- A. Identify pipe with marking including size, ASTM material classification and ASTM specification.

1.06 DELIVERY, STORAGE AND PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of the completed system.

PART 2 - PRODUCTS

2.01 CAST IRON PIPE AND FITTINGS

- A. Conform to ASTM A-74 ASTM A-888; and CISPI 301-12 and CISPI 310-12.
- B. Pipe and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute and be listed by NSF International.
- C. Standard weight pipe with drainage fittings for:
 1. Sanitary waste, vent, and drainage pipe 2" and larger above ground.
 2. Drain lines under buildings, and under exterior concrete or other paving. Extend cast iron piping at least 5 feet outside of building.
- D. Joints in Cast Iron Pipe:
 1. Below grade: Bell and spigot with neoprene compression gaskets
 2. Above grade: No-Hub using stainless couplings. Provide 4-band, heavy duty couplings for piping 2" through 10" and 6-band heavy duty couplings for piping 12" and larger. Couplings shall comply with ASTM C 1540/ FM-1680 rated no hub bands for all cast iron piping material above slab-on-grade.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Cast Iron Pipe Joints:
 1. Install compression gaskets and No-Hub bands in accordance with CISPI and ASTM installation methods and manufacturer's instructions. Refer to the required number of bands and installation criteria previously identified in the PRODUCTS section of this specification.
- B. Grading Pipes for Drainage:

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1. Uniformly place storm drainage pipes and footing drain pipes at elevations and slopes indicated. If no elevations or slopes are indicated, slope pipes at not less than 1/8" per foot.
 2. Uniformly place sanitary sewer pipes at elevations and slopes required by the local codes
 3. A double wye or double combination wye and 1/8 bend fitting is not acceptable in a horizontal position for a drainage system.
- C. Clean inside of pipe before installation. Keep installed piping clean, and protect ends from foreign matter by capping or plugging them.
- D. Do not install piping above electrical equipment such as starters, panels, variable frequency motor controllers, motor control center's, or disconnects. Maintain code required clearance above, below and to sides of electrical equipment.
- E. In so far as possible, drainage piping shall not be installed overhead, whether exposed or above ceiling, in operating rooms, delivery rooms, nurseries, food preparation or serving areas, or in rooms listed above. Where unavoidable, provide drain troughs or other means to carry away leakage.
- F. Do not install piping above or passing through any IT rooms, IDF rooms, or service entrance rooms.
- G. Run pipes in straight lines and square with building. Install risers plumb. Make offsets only where indicated and where necessary.
- H. Piping passing through or under grade beams or through foundation walls shall be provided with a schedule 40 steel pipe sleeve two sizes greater than the piping passing through the sleeve.
- I. Identify all storm, waste and vent piping in accordance with and as specified in Section 22 05 53.

END OF SECTION

SECTION 22-1319
SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section includes requirements for:
 - 1. Cleanouts
 - 2. Trap primers

1.02 RELATED REQUIREMENTS

- A. Section 22-0500 - Common Work Results For Plumbing
- B. Section 22-1116 - Domestic Water Piping
- C. Section 22-1316 - Storm And Sanitary Waste And Vent Piping

1.03 SUBMITTALS

- A. Submit product data for review in accordance with the requirements of Division 01.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 CLEANOUTS

- A. Acceptable manufacturers:
 - 1. Zurn (Zurn model numbers are used below)
 - 2. Josam
 - 3. Wade
 - 4. Jay R. Smith
 - 5. Sioux Chief
 - 6. Watts
- B. Exterior: Z1400Z heavy duty cast iron cleanout housing with internal cleanout body and plug.

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- C. Finished concrete floor: ZN1400 cast iron body with round adjustable polished nickel bronze top, ABS plug and carpet marker where required.
- D. Ceramic tile: ZN1400 Series, cast iron body, polished nickel bronze top, 1/2" terrazzo recess and closure plug.
- E. Vinyl tile floor: ZN1400-X, cast iron body, round nickel bronze top, 1/8" tile recess and closure plug.
- F. Carpet: ZN1400-CM. Inside caulk round brass scoriated frame and cover and provide carpet marker.
- G. Wall: Z1446, cast iron caulking ferrule with stainless round access cover and screws.
- H. Access covers: Minimum size 12" x 12" located for access to valves, shock absorbers, trap primers, wall cleanouts, etc.
- I. Furnish cleanouts occurring in waterproof floors with clamping devices.

2.03 TRAP PRIMERS

- A. Acceptable manufacturers:
 - 1. Josam
 - 2. Zurn
 - 3. Wade
 - 4. Jay R. Smith
 - 5. Precision Plumbing Products
 - 6. Sioux Chief
- B. Provide trap primer of brass construction, with removable operating parts, and integral vacuum breaker.
- C. See Plumbing fixture section for specifications.

PART 3 - EXECUTION

3.01 INSTALLATION AND TESTING

- A. Cleanouts
 - 1. Provide line size cleanouts up to 4"; 4" cleanout for lines larger than 4".

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2. Locate cleanouts at all changes in direction greater than 45 degrees and in straight runs as shown 100 feet outside the building on drawing or spaced not greater than required by applicable Plumbing Code.
3. Extend inaccessible cleanouts up through floor and/or wall to provide easy accessibility.

B. Trap Primers

1. Install primers in accessible location or as shown on drawings.
2. Trap primers shall be Plumbing and Drainage Institute approved.

END OF SECTION

**SECTION 22-3116
WATER SOFTENER**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Completely automatic water softener system as scheduled on the drawings, with all necessary equipment, controls, accessories, materials, piping, valves, blending valves and related items.
- B. Equipment shall be as specified herein and located as shown on the drawings.

1.02 RELATED REQUIREMENTS

- A. Section 22-0500 - Common Work Results For Plumbing
- B. Section 22-0523 - Valves For Plumbing Piping
- C. Section 22-1116 - Domestic Water Piping
- D. Division 26: Electrical

1.03 SUBMITTALS

- A. Submit product data for review in accordance with the requirements of Division 01.

1.04 QUALITY ASSURANCE

- A. Where specified, water softening equipment serving the boiler make-up system shall be capable of removing hardness (expressed as CaCO₃) from the raw water to the extent that the effluent from the water softener will be zero (0) grains per gallon of hardness determined by an accepted ASTM soap hardness test method.
- B. Where specified, water softening equipment serving the domestic water system shall contain a piped bypass for blending water to a level of 3 to 5 grains of hard water to the building supply system. See details on the drawings.
- C. All valves and piping shall be Lead Free when the softener is used in a potable water system.

1.05 WARRANTY

- A. The manufacturer shall guarantee that under actual conditions the effluent shall be zero (0) soft as determined by soap test, that the loss of mineral through attrition during the first three years of operation shall not exceed 3% per year; that the mineral shall not be washed out of the system during the service run or back washing the period; and that the turbidity and color of the effluent, by reasons of passing through the softener system, shall not be greater than the incoming water.

- B. The water softener equipment shall be warranted against failure due to material and/or workmanship for a minimum period of one year. See Division 01 for additional requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers: Culligan, Anderson Chemical Company, Bruner, Hydro-Max, Lindsay, Sta-Rite, Universal, Marlo.
- B. An authorized factory service agency providing twenty-four (24) hour service must be available within 200 miles of this installation.

2.02 EQUIPMENT REQUIREMENTS (20 TO 1000 GPM)

- A. Water Softening System: Vertical pressure type ion exchanger system with regenerating equipment, complete with all components required to insure proper operation. System shall be Duplex or Triplex with sizes and capacities as shown and scheduled on the drawings.
 - 1. Unit shall be skid mounted as required and as detailed on the drawings.
- B. Softener Tank: Welded construction of quality carbon steel with dished heads, equipped with reinforced openings for piping connections:
 - 1. Provide two 4" x 6" handholes for tanks 30" diameter and smaller, or 11" x 15" manhole in top head and 2" resin removal plug in lower side shell for tanks over 30" diameter.
 - 2. ASME Stamped and Code rated at 125 psi working pressure.
 - 3. Tanks shall be lined with 10-12 mil DFT thick phenolic epoxy lining.
 - 4. Provide with earthquake resistant structural legs with bolt downs in accordance with site seismic rating.
 - 5. Exterior paint coating: Safety Blue at a minimum of 4-6 mils DFT.
 - 6. Provide a minimum freeboard of 50% for backwash expansion above the resin bed level.
 - 7. Face piping shall be Schedule 80 PVC or Type 316 stainless steel.
 - 8. Tanks shall be bolted to the skid, not welded or otherwise permanently attached.
- C. Internal Distribution: Underdrain system shall uniformly collect softened water as well as distribute backwash laterally across entire bed.

1. Radial type construction of Schedule 80 PVC with minimum of two non-clogging ABS plastic strainers per S.F. of bed area.
 2. Furnish 1/8" x 1/16" gravel sub-fill only, not extending above strainers.
- D. Upper Distribution System: Manifold type of Schedule 80 PVC arranged for uniform distribution of both brine solution and raw water, as well as collection of backwash.
- E. Ion Exchange Resin: High capacity sulfonated polystyrene type requiring no chemicals other than sodium chloride to obtain specified capacity. Resin shall be capable of 30,000 grains of hardness capacity per cubic foot when regenerating with 15 lbs of salt.
- F. Controls: NEMA 4X or NEMA 12 enclosures with automatic regeneration through electronic programmable water treatment equipment controller and flow sensor per softener tank to initiate regeneration. The controller shall be programmed to operate as parallel progressive.
1. An automatic backwash control shall be provided with fast flush flows over wide variations of operating pressures.
- G. Provide pressure gauges with sample cocks on inlet and outlet of each tank.
- H. Regenerating Tank: Rigid, molded polyethylene or FRP construction with a flat bottom.
1. System shall be dry salt storage type with dry salt support shelf and shall allow for adjusting brine dosage to 6, 10, and 15 lbs. per cubic foot of resin with sufficient capacity for a minimum of four regenerations at full softening.
 2. Provide automatic valve to control amount of brine draw.
 3. Rated for seismic zone in accordance with site seismic rating.
 4. Provide necessary valves, eductor (venturi injector) and piping.
- I. Main Operating Valves: Nest of individual diaphragm valves with cast iron bodies, Buna-N diaphragm with stainless steel and brass internal parts for valves on tanks with 4" and smaller piping.
1. Valves shall be slow opening and closing, free of water hammer.
 2. There shall be no contact of dissimilar materials.
 3. Valves can be operated either hydraulically or pneumatically. If pneumatic actuators are used, provide an air compressor of sufficient capacity.
 4. Provide epoxy coated cast iron body, lug type butterfly service valves on softeners with 6" and larger piping with EPDM seals and stainless steel discs and stems.

- J. The softener tanks and piping shall be leak tested and electrically tested as a unit by the manufacturer before shipment.
 - 1. Skid mounted systems shall be completely assembled, pre-piped and pre-wired (in conduit) with all valves, headers and controls installed and properly supported ready for final field connection. All internal electrical wiring shall be installed and the unit ready for a single point electrical connection.

2.03 BLENDING VALVE

- A. Blending valve shall be Cla-Val Model 20-01 full port blending valve for water softening systems. Valve shall be hydraulically operated, pilot controlled, diaphragm type, globe valve with single seated composition disc. Valve connections shall be threaded to 2" in size and flanged from 2-1/2" to 8" in size. Valve accuracy shall be + /- 5 percent based on range of flow and pressures indicated.
- B. Valve shall be complete with connection type, sensing lines, flow restrictors, strainers, needle valve, pilot system isolation valve, differential control and position indicator.
- C. Valve shall be factory set to proportion and blend fluids based on water softener criteria and flow rates.
- D. Valve construction: Ductile Iron ASTM A536 with Bronze ASTM B61 trim, 125 Class or 250 Class depending upon system operating pressure. Pilot control system shall be Bronze ASTM B61 with 303 Stainless Steel trim.
- E. Valve shall operate to maintain the flow rate of one fluid in direct proportion to the flow rate of another fluid by maintaining the same percentage flow rate regardless of variable system inlet pressures or demands on the blend and shall automatically adjust to these changing conditions in response to any setting of the adjustable restriction in the line being proportioned.

2.04 TEST KITS

- A. Provide water hardness testing kit to make tests necessary for controlling operation and adjustments of brine dosage.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install complete system with all piping, valves, controls and wiring.
- B. Install system in accordance with manufacturer's written instructions and in accordance with the details on drawings.
- C. Provide valved bypass around blending valve.

- D. Provide isolation valves on either side of the blending valve and on the softener inlet and outlet.

3.02 START-UP AND TRAINING

- A. Contractor shall provide for the services of a competent supervising engineer from the water softener manufacturer to inspect the complete installation, start the water softening system in operation, and instruct the Owner's operators in the proper operation and care of the equipment. Such instruction shall be a minimum of two working days. Owner personnel shall sign-off on quality and duration of instruction.

END OF SECTION

SECTION 22-3336
WATER HEATER - ELECTRIC

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Electric Storage Water Heaters

1.02 RELATED REQUIREMENTS

- A. Section 22-0700 - Plumbing Insulation
- B. Section 22-1116 - Domestic Water Piping
- C. Division 26: Electrical

1.03 SUBMITTALS

- A. Submit product data for review in accordance with the requirements of Division 01.
- B. Include performance, capacity and wiring diagrams for each heater type and size.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with a minimum of 10 years of experience.
- B. Performance: Ensure the products perform to the requirements, ratings and capacity of the equipment scheduled on the drawings.

PART 2 - PRODUCTS

2.01 ELECTRIC STORAGE WATER HEATERS

- A. Acceptable Manufacturers:
 - 1. Lochinvar
 - 2. Bradford White
 - 3. Hesco Industries, Inc
 - 4. A. O. Smith
 - 5. State Industries
 - 6. Rheem/Rudd

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify location and clearance requirements.
- B. Install in accordance with manufacturer's recommendations and contract drawings.
- C. Insulation for water connections as specified in Section 22-0700 - Plumbing Insulation.
- D. Install electric connections under and in accordance with Division 26.
- E. Clean and test unit as required by Sections 22-0500 - Common Work Results For Plumbing. Record results and deliver as part of the project closing file.

END OF SECTION

SECTION 22-4300
HEALTH CARE PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Compliance with the provisions of Section 22-0500 - Common Work Results For Plumbing.
- B. Plumbing fixtures, trim and related items such as supplies, traps, drains, cleanouts, water closet flanges, bolts, seats and covers, fixture supports and other accessory items.
- C. Coordination of fixture requirements by reviewing architectural, structural, and equipment drawings. Install fixtures in accordance with Contract Drawings and manufacturer's rough-in drawings.
- D. Installation of water tempering devices at all public lavatories and similar hand washing fixtures and elsewhere noted on the drawings.

1.02 RELATED REQUIREMENTS

- A. Section 22-0523 - Valves For Plumbing Piping
- B. Section 22-1116 - Domestic Water Piping
- C. Section 22-1319 - Sanitary Waste Piping Specialties

1.03 REFERENCE STANDARDS

- A. Perform work in accordance with applicable codes and standards enforced by local authorities.
- B. All barrier free fixtures shall be installed in accordance with the Americans with Disabilities Act (ADA) Rules and Regulations.

1.04 SUBMITTALS

- A. Submit manufacturer's product data: fixtures; fittings; accessories and supplies for review in accordance with Division 01 requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with a minimum of five years of documented experience.

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- B. Products requiring electrical connections must be UL or ETL listed and classified suitable for the purpose specified.
- C. All fixtures, faucets, trim and accessories must be protected from damage at all times including after installation to prevent unauthorized use.
- D. All wetted surfaces of faucets, mixing valves, isolation valves, balancing valves and shower valves in potable water systems must be lead free and ASSE 1070 and NSF 61 Certified.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Fixtures: Kohler, American Standard, Zurn, Sloan.
- B. Brass Trim: McGuire Engineered Brass Company, Brasscraft, Zurn.
- C. Carriers: Jay R. Smith, Zurn Wade, MIFAB.
- D. Flush Valves: Sloan Royal, Zurn Z-6000-AV
- E. Toilet Seats: Olsonite, Beneke, Bemis, Church, Centoco.
- F. Faucets: T&S Brass and Bronze Works, Chicago Faucet Company, Kohler, Zurn, Symmons.
- G. Stainless Steel Sinks: Elkay, Just, Kohler.
- H. Flow Control Devices: Dole Flow Controls Company.
- I. Provide fixtures and trim as a complete unit as required in the individual "P" numbers listed below.
- J. Pre-fabricated insulation on water lines and P-trap under barrier free lavatories and sinks: Plumberex, Trap Wrap TrueBro, Inc. Handi Lav-Guard, McGuire Pro-Wrap. Products must meet 25/50 flame and smoke spread ratings.
- K. Thermostatic Mixing Valves: Symmons, Holby, Lawler, Powers, Leonard, Acorn, Cash Acme
- L. Emergency Equipment. Encon, Haws, Guardian, and Acorn.
- M. Electric Water Coolers: Elkay, Haws, Halsey Taylor, Murdock, and Oasis.
- N. Ice maker, coffee maker, supply boxes: Guy Gray, IPS, Oatey

2.02 MATERIALS

- A. Wall Hung Lavatories: Furnish complete with floor mounted carriers Zurn Z1231.

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- B. Countertop Sinks: Furnished complete with mounting rings where required.
- C. Fixture Color: White unless specified otherwise.
- D. Faucets and Flush Valves: Provide either integral or attached supply stops with nipples.
- E. Provide mixing valves (tempering valves) per ASSE or CSA Standards as required by the local adopted code. Mixing valves used in drinking water shall be lead free. Mixing valves (tempering valves) shall be used to supply tempered water to public hand-washing facilities and shall conform to ASSE 1070 or CSA B125.3. Example: Cash Acme model [TMV HG135](#) or approved equal.
- F. Clamping Device: Provide for drains installed in slabs above grade.
- G. Trap Primer: Provide connections for floor drain as shown on drawings.
- H. Caulking: General Electric silicon sanitary sealant or approved equal. Color to match fixture, clear for SS sinks.
- I. Provide treated wood, polystyrene pipe holder or metal backing at wall fixtures and fixture trim connections so piping and connecting faucets and valves are rigid to wall.
- J. Wrist Blade Operation:
 - 1. Pull wrist blade to operator to turn on.
 - 2. Push toward backsplash to turn off faucet.

2.03 PLUMBING FIXTURES

- A. Plumbing fixtures shall be as scheduled on the drawings. See plumbing fixture schedule for description and accessories.

PART 3 - EXECUTION

3.01 FIXTURE CONNECTIONS

- A. Connect to plumbing fixtures and equipment provided under this and other sections of the specifications, architectural drawings, and manufacturer's shop drawings. Provide rough-in connections as shown on drawings.
- B. Use schedule and details on drawings and/or manufacturer's shop drawings for connection sizes to fixtures.
- C. Provide separate p-trap for each fixture, floor drain, and piece of equipment.
- D. Provide cast iron p-traps under floor drains.

- E. Provide outlet devices which limit hot water flow to lavatories and sinks to a maximum of 0.5 GPM, sized as recommended by manufacturer and as required by ASHRAE 90.1-2016 and state and local energy codes.
- F. Install lavatories and sinks with a minimum of 4" clearance on each side, from a wall or partition.
- G. Install water closets with a minimum of 15" clearance from the centerline of the bowl to each side, from a wall, partition, divider, or another fixture.
- H. Water closets shall have a minimum of 21" clearance in front of bowl.
- I. Coordinate dimensions required for minimum fixture clearances with other Divisions.
- J. Caulk around joints at fixtures mounted on wall or floor, or backed up to walls.
- K. Mount fixtures rigid to walls as shown on drawings and details.
- L. Accessories: Factory installed grab bars and curtain rod.
- M. Install a dropped eared "L", mounted on fire treated wood backing for rigid support for all shower heads.
- N. Flush Valves: Install flush valves on wide side of water closet as required for ADA accessibility. Install water closet flush valves no higher than 44" above finished floor. Flush valve handles for urinals shall be mounted between 28" and 44" above finished floor."
- O. Rough-In (floor ice maker, coffee maker, by Owner):
 - 1. Rough-in 1/2" cold water with cutoff valve at connection.
- P. Gooseneck faucets intended for staff and patient, use shall not contain aerators but shall contain plain end outlet trim ring. Flow control devices shall be installed at the base of the gooseneck.
- Q. Provide double check valve assembly type [Watts LF007](#) on hot and cold water supply, on janitor sink faucet and any mixing faucet not equipped with integral check valve.

3.02 TESTING AND CLEANING

- A. Inspect and test work to insure that it is installed in accordance with drawings, specifications and manufacturer's requirements and is functioning as designed and required. Use test procedures and pressures as specified and required under this Division.
- B. Correct all deficiencies found and retest.

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END OF SECTION

SECTION 23-0500
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

2.01 SECTION INCLUDES

- A. Common work results for requirements specifically applicable to Division 23.
- B. Requirements of Division 01 Specifications, General Provisions of the Contract and General and Supplementary Conditions apply to this Division.

2.02 REGULATORY REQUIREMENTS

- A. Perform Work specified in Division 23 in accordance with standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect.
 - 1. NFPA 30: Flammable and Combustible Liquids Code
 - 2. NFPA 54: National Fuel Gas Code
 - 3. NFPA 70: National Electrical Code
 - 4. NFPA 72: National Fire Alarm and Signaling Code
 - 5. NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems
 - 6. NFPA 90B: Standard for the Installation of Warm Air Heating and Air Conditioning Systems
 - 7. NFPA 92A: Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences
 - 8. NFPA 96: Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
 - 9. NFPA 101: Life Safety Code
 - 10. NFPA 101A: Guide on Alternative Approaches to Life Safety
 - 11. NFPA 101B: Standard on Means of Egress for Buildings and Structures
 - 12. NFPA 105: Standard for the Installation of Smoke Control Door Assemblies and Other Opening Protectives

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13. NFPA 241: Standard for Safeguarding Building Construction, Alterations, and Demolition Operations
14. NFPA 5000: Building Construction and Safety Code
15. ANSI A17.1: Elevators, Dumbwaiters, Escalators and Moving Walks
16. ANSI Handicapped Code-A117.1
17. ASTM E814-08B: Standard Test Method for Fire Tests Penetration Firestop Systems.
18. U.L. Fire Resistance Index.
19. All applicable Occupational Safety and Health Administration (OSHA) Publications, Rules and Regulations.
20. Americans with Disabilities Act (ADA)
21. FGI Guidelines for Design and Construction of Health Care Facilities
22. Special regulations, supplement, and amendments of the State and/or local authorities having jurisdiction.

2.03 REFERENCE STANDARDS

- A. AGA: American Gas Association.
- B. ANSI: American National Standards Institute.
- C. ARI: American Refrigeration Institute.
- D. ASHRAE: American Society of Heating Refrigeration and Air Conditioning Engineers.
- E. ASME: American Society for Mechanical Engineers.
- F. ASTM: American Society for Testing and Materials.
- G. AWWA: American Water Works Association.
- H. FM: Factory Mutual
- I. IRI: Industrial Risk Insurers
- J. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry.
- K. NEMA: National Electrical Manufacturers' Association.
- L. NFPA: National Fire Protection Association.
- M. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

N. UL: Underwriters' Laboratories, Inc.

O. U.L. Fire Resistance Index

2.04 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Incomplete submittals containing unmarked cut sheets or not providing specific detail of what is being proposed will be rejected and will not be reviewed.
- C. Include Products as specified in the individual sections of Division 23.
- D. Submit shop drawing and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- E. Prepare shop drawings completely independent of the Engineer of Record's CADD files or Revit model. Should the Contractor or Vendor wish to use the Engineer of Record's CADD files or Revit model as the basis for developing their shop drawings, a release form, obtainable from the Engineer or Architect, must be signed. A nominal charge of \$50.00 per sheet must be made payable to the engineering firm to cover the cost of preparing the drawings for use by others.
- F. Submit copies of shop drawings in accordance with Division 01, including:
 - 1. Building Automation System including direct digital control drawings.
 - 2. Concrete pads and foundations including anchor bolt and sleeve locations.
 - 3. Prepare and submit coordination drawings as specified herein. Facilitate the coordination effort with all other trades, specifically Divisions 21, 22, 26 and 28 and shall include:
 - a. Coordinated room layouts shall include:
 - 1) Room dimensions.
 - 2) Support column locations.
 - 3) Locations and dimensions of equipment foundations and pads required.
 - 4) Locations and dimension of equipment and apparatus, including electrical control panels and starters, and service and coil pull areas.
 - 5) Dimensioned floor drain locations.
 - 6) Locations of wall mounted equipment.
 - 7) Trench locations and sizes.

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- 8) Sleeve locations in mechanical rooms and equipment rooms.
 - 9) AHU (fan) and duct layouts in AHU equipment rooms.
 - 10) Piping 3" and larger.
 - 11) Conduit 3" and larger.
4. Roof layouts including:
- a. Air Intakes.
 - b. Vents.
 - c. Roof mounted equipment.
- G. Brochures: Submit manufacturer's product data and brochures including:
1. Complete descriptions.
 2. Illustrations.
 3. Rating data, accessories, dimensional data, and applicable options and features marked for the specific items scheduled on drawings and specified herein.
 4. Capacities stated in the terms specified.
 5. Performance curves for all air handling units, fans, and pumps.

2.05 FIELD CONDITIONS

- A. Layouts indicated on drawings are diagrammatic and intended to show relative positions and arrangement of equipment, ductwork and piping. Coordinate mechanical work with other trades and measurements obtained at the job site, as applicable, prior to installation. Generally, install work in locations shown on Drawings, using as necessary rises, drops, offsets, transitions, and alternate routings to fit in the available space unless prevented by Project conditions.
- B. If prevented by project conditions, prepare drawings showing proposed rearrangement of Work, including changes to Work specified in other sections. Obtain permission of Architect before proceeding.
- C. Place anchors, sleeves, and supports prior to pouring concrete or installation of masonry work.
- D. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.
- E. Determine sizes and verify locations of existing utilities on or near site.

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- F. Keep roads clear of materials and debris.
- G. Visit site and be informed of conditions under which Work must be performed.
- H. Locate equipment requiring periodic servicing so that it is readily accessible. Provide means of service access, following appropriate manufacturer's recommended service clearance space or, as applicable, means of access using duct, wall, or ceiling access doors.
- I. Install ductwork and piping to leave sufficient space for AHJ inspection of wall construction.

2.06 FEES AND PERMITS

- A. Obtain and pay for all necessary permits and inspection fees required to perform Division 23 work.

2.07 COORDINATION DRAWINGS

- A. Prior to commencement of installation, prepare coordination drawings for work under this division, as specified in Division 01, in full cooperation with persons performing work under other Divisions, including but not limited to mechanical, electrical, plumbing, fire protection, telecommunications, audio/visual and miscellaneous steel.
- B. Drawings shall not be formally submitted but shall be kept on site for reference. Notify Architect and Construction Manager of conflicts that cannot be resolved.
- C. Coordination Drawings shall be prepared to include the following:
 - 1. Drawn to a scale of 1/4" = 1'-0".
 - 2. Room dimensions.
 - 3. Sheet size matching contract documents.
 - 4. Duct sizes with bottom elevation from finished floor.
 - 5. Show equipment, columns, and beams.
 - 6. Duct fitting details.
 - 7. Construction details of plenums and casings.
 - 8. Concrete pad and foundation layouts including anchor bolt and sleeve locations.
 - 9. Dimensioned floor drain locations.
 - 10. Wall mounted equipment.
 - 11. Piping 3" and larger, with elevations from finished floor to bottom of pipe.

12. Space allocation for conduits and cable trays.
13. Ceiling height.
14. Ductwork, air terminal units, and piping 3" and larger shall be shown in proper graphic scale.
15. Clearance requirements for control panels, inspections, and maintenance.
16. Coordination drawings are to indicate air terminal units, fan coil units, air handling units, control panels, and all other devices and materials to proper scale.

2.08 COMPLETENESS OF WORK

- A. The Contract Documents depict HVAC systems which are intended to be complete and functioning systems. All products, materials, and labor necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the Contractor.
- B. Catalog numbers referenced throughout the Division 23 Drawings and Specifications are intended to convey a general understanding of the type and quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra shall be allowed because a catalog number is found to be incomplete or obsolete.

2.09 COMMISSIONING

- A. An independent third party Commissioning Agent will document completion of the HVAC systems. The contractor is a member of the Commissioning Team and will participate to facilitate completion of the Commissioning process. Refer to Division 01 Commissioning Requirements for the Project Commissioning Requirements and roles and responsibilities of each member of the Commissioning Team.

2.10 PRODUCT SUBSTITUTIONS

- A. Comply with provisions of Division 01.

2.11 RECORD DRAWINGS

- A. Provide record drawings that illustrate the work of Division 23 as finally constructed. Deliver record drawings to the Architect in a form suitable for reproduction.
- B. Provide record drawings that illustrate the work of Division 23 as finally constructed. Deliver record drawings to the Architect electronic format and also three (3) copies marked in red ink to reflect work as constructed.
- C. Record drawings shall reflect all changes made to the Contract Documents, whether generated by addenda, change orders, or field conditions. Maintain a daily record of these changes and keep current set of drawings showing these changes.

- D. Deliver record drawings to Architect within 30 days of Substantial Completion.
- E. Record drawings are to indicate air terminal units, fan coil units, air handling units, fans, control panels, and all other devices and materials to proper scale.

2.12 OWNING AND OPERATING MANUALS

- A. Comply with the requirements of Division 01, but provide a minimum of three hard copy sets and an electronic copy.
- B. Manuals shall include clear and comprehensive instructions with appropriate graphics and project specific marked data to enable owner to operate and maintain all systems specified in this Division.
- C. Copies of final reviewed submittals indicating all model numbers, serial numbers, cut sheets, and all performance criteria on furnished equipment shall be included.

PART 2 - PRODUCTS

3.01 EQUIPMENT SUPPORTS

- A. Structural Steel for Supports: ASTM A36.
 - 1. Use galvanized members installed in fan plenums or areas of high humidity or condensation, and outside. All fasteners shall be stainless steel. Any damage caused by cutting, drilling, or welding or any other means to galvanized surface must be repaired by apply two coats of cold-galvanizing.
 - 2. Furnish other members with shop coat of primer.
 - 3. Retouch primer after field welding.

3.02 FLASHINGS AND COUNTERFLASHINGS

- A. Furnish materials and coordinate installation for flashing and counterflashing roof penetrations for ductwork and piping.
- B. Materials:
 - 1. Sheet metal: 24 gauge minimum ASTM A525, Class G90.
 - 2. Sheet lead: 3 pounds per square foot.
 - 3. Stainless steel: Minimum 20 gauge.
 - 4. Sheet copper: 24 OZ/SF.

3.03 WALL AND CEILING ACCESS PANELS

- A. Style and type as required for material in which installed.

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- B. Size: 24"x24" minimum, as indicated, or as required to allow inspection, service and removal of items served.
- C. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.
- D. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.
- E. Prime painted or rust inhibitive paint finish.
- F. UL labeled when in fire-rated construction, 1-1/2 hour rating.
- G. 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 fire and/or smoke dampers, mechanical system valves, and equipment needing periodic or replacement maintenance.
- H. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.
- I. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers.
 - 1. For masonry and drywall construction: Milcor Style M.
 - 2. For plastered masonry walls and ceiling: Milcor Style K.
 - 3. For ceramic tile or glazed structural tile: Use stainless steel panels.

3.04 PIPE ENCLOSURES

- A. Minimize number of covers by enclosing maximum number of pipes in each drop.
- B. Anchor to equipment or partition.
- C. Fasten seams and joints with stainless steel pop rivets.
- D. Provide 1-1/2" ceiling flange as closure.

3.05 ESCUTCHEON PLATES

- A. Provide B & C No. 10 or equal chrome plated escutcheon plates where pipes penetrate partitions or ceilings in finished areas.

PART 3 - EXECUTION

4.01 CUTTING AND PATCHING

- A. Repair or replace damage caused by cutting or installation of work specified in Division 23.
- B. Perform repairs with materials which match existing and install in accordance with the appropriate section of these specifications.

4.02 FLASHING AND COUNTERFLASHING

- A. Counterflash ducts and pipes where penetration of roofs and outside walls occur.

4.03 CONNECTION TO EQUIPMENT FURNISHED BY OWNER

- A. Connect and/or install equipment shown on mechanical drawings that requires mechanical connections.
- B. Provide piping, isolation valves, unions, and other piping appurtenances required for a complete installation.
- C. Provide steam strainers, steam traps, and pressure reducing valves in steam lines.

4.04 DELIVERY, STORAGE, AND PROTECTION

- A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where deliver in original packaging is not practical, provide cover and shielding for all items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storing to keep items from being damaged.
- B. Store items in a clean, dry place, and protect from damage. Mechanical equipment may not be staged or stored outdoors unless intended for outdoor use.
- C. Protect nameplates on motors, pumps, and similar equipment. Do not paint or insulate over nameplate data.
- D. Protect valves and piping from damage. Cover equipment during work of finishing trades.
- E. Keep dirt and debris out of pipes and ducts.
- F. Repair, restore, and replace damaged items.
- G. Cover factory finished equipment during work of finished trades, such as fan coils, fin tubes, etc.
- H. Protect cooling and/or heating coils with temporary filter media during construction.

4.05 CLEANING HVAC SYSTEMS

A. General Cleanup:

1. Upon completion of contract and progressively as work proceeds, clean up dirt, debris, old materials, etc., and remove from site, keeping premises in neat and clean condition to satisfaction of the Architect. See Division 01 of specifications for further requirements.
2. Seepage, discoloration or other damage to parts of the building, its finish, or furnishings due to Contractor's failure to properly clean piping systems or duct systems shall be repaired without cost to the Owner.

B. Factory Finishes:

1. Clean items with factory finishes. Touch up bare places, scratches and other minor damage to finishes. Use only factory supplied paint of matching color and formula. If finishes are badly damaged or if there are many damaged, scratched or bare places, refinish the entire item.

C. Ducts and Apparatus:

1. Thoroughly clean ducts and apparatus casings before fans and filters are operated.

4.06 OPERATION OF HVAC SYSTEMS DURING CONSTRUCTION

- A. Install all specified filters prior to system operation. In addition to specified filters, install a roughing filter upstream of mixed air filter. Roughing filter shall consist of two layers of roll filter media clipped and sealed to entering side of filter frame. Change roughing filter as necessary to minimize dust collection on specified filters.
- B. Cover return and exhaust air grilles with temporary filter media. Attach media to avoid damage to grille or ceiling. Change temporary media as required to protect against dust buildup on ductwork. Remove temporary media from grilles after flooring is installed, walls are sanded and painted and other dust generating construction has been completed.
- C. During periods of excessive dust generation such as drywall sanding, seal off return and exhaust openings and grilles to prevent dust from accumulating in ductwork.
- D. If outside air source contains less dust than building air, adjust A/C unit dampers to operate with as much outside air as possible without causing a freezing condition for coil or exceeding capacity of coil to adequately condition supply air.
- E. Furnish and install a new set of specified filter media prior to start of system test and balance. Furnish a new, clean set of the specified media and turn over to Owner's Representative.

4.07 TESTING MECHANICAL SYSTEMS

- A. Test all systems and equipment installed to demonstrate proper operation.
- B. Advise Architect of scheduled systems testing and completed system demonstration/operation schedules so that he may witness, if desired.
- C. Correct and retest work found defective when tested.
- D. Make repairs to piping systems with new materials. Peening, doping, or caulking of joints or holes will not be acceptable.
- E. Ductwork Pressure Testing: Refer to Section 23 31 13 for required pressure testing for ductwork.
- F. System Balance and Testing: Prepare to assist test and balance firm by assuring systems are complete and operational.
- G. Test all fire dampers by manually disconnecting linkage and observing blades fall into position.
- H. Test all smoke and combination fire/smoke, dampers by observing damper operation during fire alarm system commissioning.
- I. Records of Testing: Maintain records of system testing and results thereof. Deliver results as part of project closing file and on an intermediate basis as requested by Architect.

END OF SECTION

SECTION 23-0513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.
- D. Three phase electric motors.
- E. Electronically Commutated Motors (ECM).

1.02 RELATED REQUIREMENTS

- A. Section 26-0583 - Wiring Connections
- B. Section 26-2913 - Enclosed Controllers.
- C. Section 26-2923 - Variable Frequency Motor Controllers

1.03 REFERENCE STANDARDS

- A. Each motor, controller and all components shall be designed, manufactured and tested in accordance with the following applicable standards:
 - 1. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.
 - 2. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2017.
 - 3. IEEE Standard 112, Test Method "B"; 1996.
 - 4. IEEE Standard 444 (ANSI C34.3); 1992.
 - 5. IEEE Standard 519; 1992.
 - 6. NEMA MG 1 - Motors and Generators; 2021.
 - 7. NEMA MG1, Part 31 - Definite Purpose, Inverter Fed Motors; 2012.
 - 8. NEMA - ICS-3-303
 - 9. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 10. Energy Policy Act of 1992

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- B. All equipment and material to be furnished and installed on this Project shall be UL or ETL listed, in accordance with the requirements of the authorities having jurisdiction, and suitable for its intended use on this Project.

1.04 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements for submittal procedures.
- B. Submit motor information with submittals and shop drawings for Division 23 equipment.
- C. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- D. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.
- E. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- F. Operation Data: Include instructions for safe operating procedures.
- G. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Baldor Electric Company/ABB Group; _____: www.baldor.com/#sle.
- B. Leeson Electric Corporation; _____: www.leeson.com/#sle.
- C. General Electric
- D. Gould

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- E. Marathon
- F. Reliance
- G. Siemens
- H. Toshiba
- I. U. S. Motors

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service: Refer to Section 26-0583 for required electrical characteristics.
- B. Electrical Service:
 - 1. Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz.
 - 2. Motors larger than 1/2 Horsepower: 460 volts, three phase, 60 Hz.
- C. Windings and Insulation:
 - 1. All motors shall have copper windings.
 - 2. Motors shall be equipped with Class B, 80 deg. C rise or Class F, 105 deg. C rise insulation suitable for use in a 40 deg. C ambient temperature.
 - 3. Motors used for cooling tower applications shall be equipped with Class F, 105 deg. C insulation suitable for use in a 40 deg. C ambient temperature. Windings shall be treated with an epoxy varnish to inhibit the moisture absorption.
- D. Bearings:
 - 1. Single phase, fractional horsepower motors shall be equipped with quiet operating, all angle babbitt lined sleeve bearings.
 - 2. Polyphase motors shall be equipped with deep groove type ball bearings, generously sized for the loads to which applied and for severe duty application. Provide the necessary seals on the shaft to keep the bearing system free of contamination and moisture. Lubricant shall be high temperature, non-bleeding grease.
 - a. Provide inlet and outlet plugs on poly phase motors so that grease fittings can be easily inserted for bearing lubrication except as otherwise specified. The end shields shall be carefully machined to add extra grease capacity. Lower outlet plugs shall be equipped with combination breather/drains on TEFC and TEAO motors.

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT 23-0513 -4

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- E. Motors on belt driven equipment shall have slide rails with adjusting screws for belt tension adjustment.
- F. Motors specified with variable frequency motor controllers shall comply with NEMA MG1, Part 31 for Definite Purpose, Inverter Fed motors including insulation meeting the requirement for 1600 Vpk at 0.1 uS rise time. In addition to compliance with MG1, Part 31, motors also shall be designed for starting across the line and specifically designed to reduce inrush current.
 - 1. To protect motor bearings and shafts from damage due to induced electrical currents along the motor shaft, provide Aegis shaft grounding ring (SGR), conductive microfiber motor shaft grounding ring on the driven end of all inverter fed motors. For inverter fed motors 100 HP and larger, also provide either an insulated motor bearing or a ceramic bearing on non-driven end of motor. Comply with manufacturer's installation instructions and with NEMA MG1, Part 31 for inverter fed motor bearings.
- G. Sound power levels shall not be greater than recommended in NEMA M61-12.49. Inverter duty rated motors shall not increase by more than 3 dB when operating on a variable frequency motor controller.
- H. Provide motors with drive shafts long enough to extend completely through belt sheaves when sheaves are properly aligned and balanced.
- I. Motors exposed to the weather shall be weather protected.
- J. Install premium efficiency electric motors for motors 1 horsepower and above. Premium efficiency motors shall have efficiency and losses determined in accordance with the latest revisions of IEEE Standard 112. Polyphase squirrel cage motors rated 1 through 150 horsepower shall be tested by dynamometer method B. The efficiency shall be determined using segregated losses in which stray load loss is obtained from a linear regression analysis to reduce the effect of random errors in the test measurements. Guaranteed minimum load efficiency shall be as follows:
 - 1. HP:3/4 Eff:80.0%
 - 2. HP:1 Eff:84.0%
 - 3. HP:1 1/2 Eff:86.5%
 - 4. HP:2 Eff:86.5%
 - 5. HP:3 Eff:89.5%
 - 6. HP:5 Eff:89.5%
 - 7. HP:7 1/2 Eff:91.7%

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8. HP:10 Eff:91.7%
 9. HP:15 Eff:93.0%
 10. HP:20 Eff:93.6%
 11. HP:25 Eff:93.6%
- K. Construction:
1. Open drip-proof type except where specifically noted otherwise.
 2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
 4. Motors with frame sizes 254T and larger: Energy efficient type.
- L. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- M. Motors shall be specifically designed for quiet operation and for severe duty. Standard open drip proof motors shall be equipped with aluminum or stainless steel stamped nameplates. Totally enclosed fan cooled and air over motors shall be equipped with stainless steel stamped nameplates with either zinc or cadmium plated hardware. Motor nameplates shall clearly indicate frame size, horsepower, frequency, voltage, speed, starting torque class, insulation class, service factor and winding material.
- N. Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 APPLICATIONS

- A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.
- B. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.
- C. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

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- D. Three phase motors for blowers, fans, pumps, and other HVAC equipment: Squirrel cage type.

2.04 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, pre-lubricated sleeve bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, pre-lubricated ball bearings.

2.05 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Comply with NEMA MG 1 for Design B motors.
- E. Insulation System: NEMA Class B or better.
- F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
- G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 26-2913.
- I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for re-lubrication, rated for minimum ABMA STD 9, L-10 life of

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20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

- J. Sound Power Levels: To NEMA MG 1.
- K. Part Winding Start Where Indicated: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.
- L. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
- M. Nominal Efficiency: As indicated at full load and rated voltage when tested in accordance with IEEE 112.
- N. Nominal Power Factor: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

PART 3 - EXECUTION

4.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install base mounted motors securely on firm foundation.
- C. Align motors on direct drive equipment using dial type gauges.
- D. Check line voltage and phase and ensure agreement with nameplate. Test motor for proper rotation under Division 26.

4.02 ADJUSTMENTS

- A. Motors, together with driven equipment, shall be dynamically and statically balanced. Imbalance shall be reduced to minimum specified by equipment manufacturers.

END OF SECTION

SECTION 23-0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hangers for HVAC piping
- B. Hangers and supports for equipment and other HVAC/hydronic work.

1.02 RELATED REQUIREMENTS

- A. Section 23-0523 General Duty Valves for HVAC
- B. Section 23-0700 HVAC Insulation
- C. Section 23-2113 HVAC Piping
- D. Section 03 30 00 - Cast in Place Concrete

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- C. MFMA-4 - Metal Framing Standards Publication
- D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation
- E. NFPA 101 - Life Safety Code
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

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4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with the structural requirements.

1.05 SUBMITTALS

- A. Submit product data and information in accordance with the provisions of Division 01.
- B. Indicate where each type of hanger will be used, what piping service, if pipe system will be insulated and with what insulation thickness.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instruction for storage, handling, protection, examination, preparation and installation of product.

1.06 DELIVERY, STORAGE AND PROTECTION

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 METAL CHANNEL (STRUT) FRAMING SYSTEMS:

- A. Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field assembly of supports.
- B. Acceptable Manufacturers: Anvil, B-Line, Unistrut, or approved equal.
- C. Furnish channels and associated fittings, accessories, and hardware produced by a single manufacturer.
- D. Comply with MFMA-4.
- E. Material and Dimensions: Galvanized steel; 1-5/8 inch width by 1-5/8 inch height; 14 gauge minimum.

2.02 HANGER RODS

- A. Provide mild steel all-thread rods with maximum loads as follows:
 1. 3/8" - 300 lbs

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT 23-0529 -3

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2. 1/2" - 600 lbs
3. 5/8" - 1,200 lbs
4. 3/4" - 2,000 lbs
5. 1" - 5,000 lbs

2.03 EQUIPMENT MOUNTING SUPPORTS

- A. Acceptable Manufacturers: Thybar Corporation or approved equal.
- B. Construction: Factory fabricated sheet steel of 14 or 18 gauge galvanized shell, base plate and counter flashing; wood nailer; sloped cant; welded construction and reinforced bulkhead.
- C. Size: Height and load bearing capacity as required by supported equipment.
- D. Suitable for insulated and non-insulated roof decks as required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as required.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, evaluation report and conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit or other systems.
- D. Unless specifically indicated or approved by the Architect, do not provide support from suspended ceiling grid support system or ceiling grid.
- E. Do not penetrate or otherwise notch or cut structural members without approval of the Architect and Structural Engineer.
- F. Equipment Support Attachment:

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1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
- G. Secure fasteners according to manufacturer's recommended torque settings.
- H. Sway Bracing
1. Provide sway bracing and additional supports to meet the seismic bracing requirements.

END OF SECTION

SECTION 23-0549
VIBRATION ISOLATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolators, pipe supports, and equipment anchors, of appropriate sizes and weight loading to meet the specified deflection requirements, in accordance with instructions of isolator manufacturer.
- B. Vibration isolation for all Division 22 and 23 systems as noted below. Provide all miscellaneous items (angle iron, bolts, rods, etc.) required for a complete system. Contractor and vendors shall thoroughly coordinate all vibration isolation systems.
- C. Coordination of installation with other trades (placement of anchor bolts in concrete slabs, etc.)

1.02 RELATED REQUIREMENTS

- A. Section 01-4533 - Code-Required Special Inspections and Procedures
- B. Division 22: Plumbing

1.03 MANUFACTURER RESPONSIBILITIES

- A. Manufacturer of vibration isolation and seismic control products shall have the following responsibilities:
 - 1. Manufacturer of vibration isolation shall have the following responsibilities:
 - a. Determine vibration isolation and restraint sizes and locations for mechanical and plumbing equipment.
 - b. Determine vibration isolation sizes and locations for mechanical and plumbing equipment.
 - c. Provide isolation systems and seismic restraints for all plumbing and mechanical of equipment (vibration isolated and non-isolated) and systems (piping and ductwork).
 - d. Provide isolation systems for all plumbing and mechanical of equipment (vibration isolated and non-isolated) and systems (piping and ductwork).
 - e. Provide seismic restraints for Division 22 and 23 piping at wall penetrations and at vertical risers. Provide sleeves, sleeve packing, guides and seismic calculations for pipe support.

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- f. Provide seismic restraints for Division 22 and 23 control panels and equipment starters. Provide attachment bolts, resilient mounts, and associated seismic calculations.
 - g. Provide installation instructions and drawings.
 - h. Provide calculations to determine restraint loads resulting from seismic forces presented in:
 - 1) International Building Code
- B. Use the most stringent of governing codes, project seismic requirements, or 0.5G minimum seismic acceleration applied at the equipment center of mass. Seismic calculations shall be certified by an engineer who is licensed in the State of this project and has a minimum of 5 years documented experience in the design of seismic restraints for flexibly mounted equipment and piping.
- C. Provide certification of seismic restraints capability to safely accept loads resulting from seismic forces determined by methods defined above. Certification must be substantiated by calculations or test reports verified by a licensed engineer.
- D. Vibration isolation specialist shall coordinate his work with that of other trades to verify that equipment speeds, in revolution per minute (rpm), are based upon actual equipment installed at the project site.
- E. Verify that equipment rpm and spring deflection selected are arranged so that resonance is avoided.
- F. Exact mounting sizes, dimensions and quantity of isolators and static deflection required shall be determined by the isolator manufacturer based upon equipment that will be furnished and installed by the contractor under this Contract.

1.04 SUBMITTALS

- A. Submit product data and related information noted below in accordance with the provisions of Division 01.
- B. Contractor's Certification: Vibration isolator submittals shall include a certification, signed by an officer representing the Contractor and stipulating that the submittal prepared by the manufacturer has been reviewed, and checked on an item by item basis against each piece of mechanical equipment, piping, ductwork and panel shown or specified in the Contract Documents, which requires vibration isolation and/or support.
- C. Manufacturer's Certification: The manufacturer or manufacturers (if there are more than one) shall each certify that the selections of seismic restraint and vibration isolation equipment are based upon the drawings and specifications, and that each piece of mechanical equipment has been examined for rotational speed, equipment

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type, mounting location, and supporting span between column centers, and that an appropriate isolator has been selected.

- D. Product Data: Furnish manufacturer's product data covering each seismic restraint and isolator type for style, characteristic, and finish. Seismic restraint and isolator quantities, dimensions, deflections, capacities and types shall remain the responsibility of the manufacturer and the contractor.
- E. Shop Drawings: Provide layout drawings, drawn to a scale of not less than 1/8-inch to 1-foot, showing the proposed layout of equipment and piping systems and the location and type of each vibration isolation and restraint device. Carefully examine other sections requiring coordinated shop drawings, including but not limited to Section 23-3113, "Sheet metal Ductwork", Section 23-3114, "Sheet metal - Special Ductwork", and prepare restraint/isolation shop drawings to the same scale showing the location of each vibration isolation equipment base, pipe hanger, flexible connection, and isolator restraint device.

1.05 QUALITY ASSURANCE

- A. Responsibility for Products: Select deflection for spring isolators in accordance with recommendations in the current issue of ASHRAE Handbook of Fundamentals, unless noted otherwise on drawings.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than 10 years of documented experience.
 - 1. Member of Vibration Isolation and Seismic Control Manufacturers Association (VISCMA).

1.06 STORAGE AND PROTECTION

- A. Storage: Store vibration isolation equipment indoors in the manufacturer's original shipping containers. Preclude the entrance of construction dirt and debris. Vibration isolation equipment and bases, which show signs of rust, cement or concrete fouling, dirt and construction debris shall be disassembled and cleaned, approved or removed from the project site and replaced with new.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Amber Booth, Kinetics Noise Control, Korfund Company, Mason Industries, Vibration Eliminator Co., or Vibration Mountings & Controls.
- B. Furnish vibration isolators by single manufacturer.
- C. Substitutions: Refer to Division 01.

2.02 PRODUCTS

- A. Type 6A: Mason PC30N, spring and double neoprene hanger, 1-1/4" neoprene element at top of housing, spring seated in neoprene cup at bottom of housing, designed to allow 30 degree arc from side to side of hangar rod, precompressed and locked at rated deflection with seismic up stop, with scale to show deflection.
- B. Type 7: Mason SCB, SCBH, SCBV cable assembly, galvanized aircraft cable with steel cable end connections, designed to resist seismic loads with a minimum safety factor of 2.
 - 1. Product to have California OSHPD Pre-Approval rating.
- C. Type 8: Mason SSB, solid steel channel brace with steel connector assemblies, designed to resist seismic loads with a minimum safety factor of 2.
 - 1. Product to have California OSHPD Pre-Approval rating.
- D. Type 11: Mason RSC, spring isolation curb for roof mounted equipment, heavy gauge Z section sheet metal base that supports adjustable and removable restrained spring mounts, top section to be continuous rail support for equipment; springs to rest on 1/4" neoprene pads; hardware shall be plated and springs furnished with rust resistant finish; curb to be waterproofed using continuous galvanized flexible counter flashing, joined at corners with EDAM bellows; spring locations to have removable, waterproof access ports.
 - 1. Product to have California OSHPD Pre-Approval rating
- E. Type 13: Mason HS spring hanger, spring seated in neoprene cup.

2.03 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall conform to the respective specifications and other requirements specified below:
 - 1. Squarehead bolts and heavy hexagon nuts, ANSI B18.2.1 and ANSI B18.2.2, and ASTM A 307 or ASTM A 576.
 - 2. Sway Brace Material used for members shown on mechanical drawings, except for pipes, shall be structural steel conforming with ASTM A 36. Steel pipes shall conform to ASTM A 501.

PART 3 - EXECUTION

3.01 VIBRATION CONTROL

- A. Size vibration control equipment in accordance with weight distribution, pull or the imposed torque as shown on equipment shop drawings. Minimum static deflections may be revised subject to prior approval.

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- B. Provide revised vibration control equipment to match revised or substituted equipment.
- C. Install vibration control equipment in accordance with the manufacturer's installation instructions and as specified.
- D. Install equipment on vibration isolation curbs to provide watertight seal.

3.02 APPLICATIONS

- A. Equipment: Use the vibration and restraint types listed above on the following applications:
 - 1. A/C units, packaged DX rooftop: Type 11
 - 2. Terminal boxes: Type 7 or 8
 - 3. Unit heaters
 - a. Type 8, 13
- B. Ductwork
 - 1. Seismically restrain all ductwork with type 7 or 8 restraints as listed below:
 - a. Rectangular or flat oval ducts with a cross sectional area 6 sq. ft. or larger
 - b. Round ducts with diameter of 28" or larger
 - 2. All ductwork that is suspended such that the distance from the top of the duct to the point of attachment to structure above is 12" or less does not need to be seismically restrained.
 - 3. Install transverse restraints at 30' intervals but not less than at both ends and at each duct turn.
 - 4. Install longitudinal restraints at 60' intervals but not less than at each duct turn.
 - 5. Reinforce duct at restraint locations.
- C. Seismically restrain all piping with type 7 or 8 restraints as listed below:
 - 1. Gas piping 1" and larger
 - 2. All piping in mechanical rooms 1-1/4" and larger
 - 3. All other mechanical and plumbing piping 2-1/2" and larger
 - 4. Install transverse restraints at 40' intervals
 - 5. Install transverse restraints at 20' intervals on fuel oil piping

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6. Install longitudinal restraints at 80' intervals
 7. Install longitudinal restraints at 40' intervals on fuel oil piping
- D. Guides and anchors provide for steam expansion may be used for restraint provided that seismic loading capacity is included with thermal expansion loads in determining size of anchor or guide.
- E. Use hold down clamps to attach multiple pipes to trapeze hangers.

3.03 ANCHORING

- A. Installation: Installation shall comply with manufacturer's published recommendations and shall be installed so that isolators are plumb and are operating at a manner for which they were designed.
- B. Unless otherwise specified, all equipment shall be securely bolted to isolators, steel bases or concrete inertia bases.
- C. Spring isolators under equipment mounted on steel grillage or similar supports shall be securely fastened to the support structure to prevent movement.

3.04 SPREADERS

- A. Spreaders shall be provided between racked or adjacent piping runs to prevent contract during seismic activity whenever pipe or insulated pipe surfaces are less than 4 inches apart or four times the maximum displacement due to seismic force. Spreaders to be applied at same interval as sway braces. Spreaders shall be applied to surface of bare or insulated hot pipe and over insulation utilizing high-density inserts and pipe protection shields were vapor-barrier-type insulation is employed.

3.05 ANCHOR BOLTS

- A. If the size and number of the anchor bolts are not shown on the drawings then anchor bolts shall conform to the schedule for the various equipment weights or the manufacturer's installation recommendations, whichever is the most stringent.

3.06 MISCELLANEOUS EQUIPMENT

- A. The following specific items of equipment to be furnished under this contract shall be manufactured and assembled, and constructed so as to be capable of withstanding the horizontal equivalent static force of 0.11 times the operating weight of the equipment, at vertical center of gravity of the equipment without causing permanent deformation, dislocations, separation of components, or other damage, which would render the equipment inoperative for significant periods of time following an earthquake.

1. Air-Handling Units

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2. Medical Air Compressor
3. Water Heaters
4. Packaged Pump Systems
5. Water softeners

3.07 INSTALLATION

- A. Install isolators in accordance with recommendations of isolator manufacturer and equipment manufacturer.
- B. Isolate mechanical equipment as indicated.
- C. Remove all debris from under equipment, and thoroughly clean steel bases, inertia bases and check for free movement.

END OF SECTION

SECTION 23-0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. HVAC systems testing and balancing requirements.

1.02 REFERENCE STANDARDS

- A. AABC - Associated Air Balance and Control
- B. NEBB - National Environmental Balancing Bureau

1.03 SCOPE OF WORK

- A. Perform test and balance in accordance with AABC or NEBB Standards.
- B. The air balance procedure followed and forms used shall agree with AABC or NEBB Standards.
- C. Make changes to pulleys, belts, dampers, impellers, and similar equipment to obtain design conditions as required by TAB procedures.
- D. The Architect, Engineer, Owner, or Owner's Representative may request a recheck, resetting, or verification of an air or water related item within 90 days of the completion of work. The work shall be provided at no additional cost.

PART 2 - PRODUCTS

2.01 NOT APPLICABLE

PART 3 - EXECUTION

3.01 PROCEDURES

- A. On completion of work, submit three copies of the complete report to include the following:
 - 1. Current certification documentation of all TAB equipment used.
 - 2. Current certification of TAB personnel responsible for the work.
 - 3. Dates, time, all personnel, and operating status of cooling and heating systems.
 - 4. A description of the procedure used for air and water balance.

3.02 AIR SYSTEMS

- A. Balance supply, return, and exhaust air outlets within 10% of design while still maintaining required pressure relationships.
- B. On each fan system, measure and report:
 - 1. Design and actual fan RPM. Fan suction and discharge pressure. Fan total static pressure, and pressure drop across components. Design and actual supply, return, exhaust, and outside air CFM.
 - 2. Actual and motor nameplate voltage and amperage on fans.
 - 3. Design and actual entering and leaving air temperatures, heating and cooling (dry bulb and wet bulb) of the supply, return, exhaust, and outside air.
- C. For diffusers and grilles, measure, adjust, and report:
 - 1. Design and actual CFM at each supply, return, and exhaust outlet.

END OF SECTION

**SECTION 23-0700
HVAC INSULATION**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Insulation requirements for following systems:
 - 1. Ductwork and plenums

1.02 RELATED REQUIREMENTS

- A. Section 23 05 53 - Identification for HVAC Piping and Equipment
- B. Section 23 21 13 - HVAC Piping
- C. Section 23 21 16 - Hydronic Piping Specialties
- D. Section 23 23 00 - Refrigerant Piping System
- E. Section 23 31 13 - Sheet metal Ductwork
- F. Section 23 31 14 - Sheet metal - Special Ductwork

1.03 DEFINITIONS

- A. Exposed - Equipment, ducts and piping in areas which will be visible without removing ceilings or opening access panels.
- B. Concealed - Installed above ceiling, in walls or chases.
- C. Outdoors - Exposed to the weather or ambient conditions.
- D. Underground - Buried.

1.04 REFERENCE STANDARDS

- A. ASTM C553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.
- C. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2011.
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2012.
- E. SMACNA (DCS) - HVAC Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.05 SUBMITTALS

- A. Provide product data and required information under the provisions of Division 01.
- B. Submit manufacturer's product data and installation procedures for review. Product data shall identify specific thermal characteristics, list of materials and thickness for each service.

1.06 QUALITY ASSURANCE

- A. Fire-Test Response Characteristics: Testing in accordance with ASTM E84. Insulation and related materials, adhesives, coatings, sealers, jackets and tapes, shall have a fire-test response characteristic of: Flame spread rating of 25 or less; Smoke development of 50 or less. If a product complies with ASTM E84 only in limited thickness, provide only those sizes which comply and use multiple layers as required to get required thickness.
- B. Materials shall meet the requirements of NFPA 90A.

PART 2 - PRODUCTS

2.01 DUCTWORK INSULATION

- A. Blanket Type Duct Insulation:
 - 1. Acceptable manufacturers: CertainTeed, Johns-Manville, Knauf, or Owens Corning.
 - 2. Provide with Foil Reinforced Kraft (FSK) vapor barrier with a maximum Perm rating of 0.02 or less, providing the minimum "R" value and pound per cubic foot (PCF) density shown below.
 - 3. Use on the following:
 - a. Unlined supply and return air ductwork in an unconditioned space, including concealed above ceiling: 2.2", 0.75 PCF, installed "R" value of 6.0.
- B. Duct Insulation Sealants:
 - 1. All duct insulation vapor barrier sealants and mastics shall be water based, low VOC with a maximum perm rating of 0.02 or less; Design Polymerics 3040 or equal.
 - 2. Foil tape is not acceptable.

2.02 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

- A. Elastomeric adhesives and finishing:

1. Adhesive shall be the insulation manufacturer's recommended contact adhesive, Armaflex 520, Armaflex 520BLV or equivalent.
2. Insulation finish shall be the insulation manufacturer's recommended finish--WB Armaflex finish and shall be paintable.
3. Accessories such as adhesives, mastics and cements shall have the same properties as listed above and not detract from any of the system ratings as specified.
4. Where exposed to view inside buildings, the painted finish color shall be as selected by the Architect.

B. Do not insulate valve stems.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

- A. Deliver and store insulation materials in manufacturers containers and keep free from dirt, water, chemical and mechanical damage.
- B. Complete piping and ductwork pressure testing prior to applying insulation.
- C. Apply insulation in workmanlike manner by experienced, qualified, workmen.
- D. Do not install duct sealants on systems that are operating. Follow manufacturers written instructions for proper cure times.
- E. Surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and before and during application of any finish, unless such finish specifically requires a wetted surface for application.
- F. Adhesives, cements and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state and not diminish or void the specified flame spread and smoke developed ratings.
- G. Stop duct coverings, including jacket and insulation, at fire penetrations of fire or smoke rated partitions, floors above grade and roofs. "Fan-out" or extend jacketed insulation at least 2" beyond angle frames of fire dampers and secure to wall. Maintain vapor barrier.

3.02 BLANKET TYPE DUCT INSULATION

- A. Apply jacketed blanket type glass fiber covering to ducts pulled snug but not so tight as to compress corners more than 1/4". Use insulation having 2" tab, or cut insulation long enough to allow for "peel-off" of insulation from jacket to effect a minimum overlap of 2". Staple lap with flare type staples on 1" centers. Cover standing seams, stiffeners, and braces with same insulation blanket, using 2" jacket lap and staple lap as herein

before outlined. Cover and seal all staples with Foster 30-80 reinforced with glass cloth. Do not use pressure sensitive tape.

- B. Secure jacket to covering using equivalent of Foster No. 85-20 or Childers CP-82 adhesive.
- C. For ducts 24" or wider, mechanically fasten insulation to duct bottom, using weld or adhesive pins having self-locking, metal discs, locating fasteners on not over 12" centers laterally and longitudinally. Seal pins as above.
- D. For ducts up to 24" deep, mechanically fasten insulation to duct sides, using one row of pins, plates or discs located on not over 12" centers longitudinally and equidistant laterally between duct top and bottom. For ducts 24" deep and greater, apply fasteners as before only using minimum of two rows.

END OF SECTION

SECTION 23-0913
INSTRUMENTATION AND CONTROL DEVICES

PART 1 - GENERAL

2.01 SECTION INCLUDES

- A. Input and output control devices to integrate with direct digital control and building automation system.
- B. Furnish instrumentation control devices as an integral part of the Building Automation Section specified in Section 23 09 23 - Building Automation Systems

2.02 RELATED REQUIREMENTS

- A. Section 23 05 00 Common Work Results for HVAC
- B. Section 23 09 23 - Section 23 09 23 - Building Automation Systems
- C. Section 23 20 00 - HVAC Piping
- D. Section 23-3113 - Sheetmetal Ductwork
- E. Section 23 36 00 - Air Terminal Units
- F. Division 26: Electrical

2.03 SUBMITTALS

- A. Submit product data and schedules for all input/output devices in accordance with the requirements of Division 01.

PART 2 - PRODUCTS

3.01 ACCEPTABLE MANUFACTURERS

- A. Provide products and components by manufacturers listed. Where manufacturers are not listed, provide component that complies with specifications.
- B. Manufacturers listed must meet performance and material specifications of product or component. Listing of a manufacturer as an acceptable manufacturer does not grant permission to deviate from the specification requirements.
- C. All airflow-measurement stations shall bear the AMCA Certified Ratings Program seal for Air Performance.

3.02 INPUT DEVICES

A. General Requirements

1. Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements.

B. Temperature Sensors

1. Acceptable Manufacturers: Automated Logic, Johnson Controls, Setra, Siemens, or Trane.

- a. Substitutions: Refer to Division 01.

2. General Requirements:

- a. Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.

- b. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.

- c. Accuracy values indicated include errors associated with the sensor, lead wire, and analog to digital conversion.

3. Room Temperature Sensors

- a. Refer to temperature sensor legend, schedules, floor plans, and control sequences for specific room temperature sensor requirements in each zone.

- b. Room sensors shall be constructed for either surface or wall box mounting.

- c. Room sensors shall have the following options when specified:

- 1) Local setpoint adjustment providing a +/- 3 degree (adjustable) range.

- 2) Timed override request push button with LED status for activation of after-hours operation.

- 3) Flush mounting (sensor only, no local adjustment)

- 4) Integral LCD display and keypad with the following capabilities:

- (a) Display room and outside air temperatures.

- (b) Display room setpoint.

- (c) Password selectable adjustment of setpoint and override modes.

4. Stand Alone Thermostats

5. Outside Air Sensors

- a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
- b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
- c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.

6. Duct Mount Sensors

- a. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.
- b. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
- c. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.

7. Averaging Sensors

- a. Provide at the following locations:
 - 1) Heating coils and cooling coils at air handling units and fan coil units.
 - 2) Ductwork greater in any dimension than 48 inches and/or where air temperature stratification exists.
- b. For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.
- c. Capillary supports at the sides of the duct shall be provided to support the sensing string.

8. Low Limit Temperature Sensors

- a. Provide vapor charged sensing element that reacts to coldest 14" of sensor length.
- b. Sensor shall have field adjustable setpoint.

C. Dewpoint Sensors

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1. Acceptable Manufacturers: E+E Elektronik
2. Substitutions: Refer to Division 01
3. Single unit to measure dry bulb temperature, relative humidity and calculate/report dewpoint. Equal to E + E Elektronik EE210.
4. Input power 24 VAC
5. Output 0-20 mA, 0-10 VDC
6. Provide wall mount, duct mount or remote sensor mounting as shown on plans.

D. Differential Pressure Transmitters

1. Acceptable Manufacturers: Automated Logic, Johnson Controls, Mamac, Setra, or Siemens.
 - a. Substitutions: Refer to Division 01.
2. General Air and Water Pressure Transmitter Requirements:
 - a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.
 - b. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.
 - c. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.
 - d. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.
3. Differential Air Pressure Applications
 - a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
 - b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:

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- 1) -1.00 to +1.00 w.c., 0" to 5" w.c. input differential pressure ranges. (Select range appropriate for system application)
 - 2) 4-20 mA output.
 - 3) Maintain accuracy up to 20 to 1 ratio turndown.
 - 4) Reference Accuracy: +0.2% of full span.
- c. For 5" to 21" input differential pressure ranges, the pressure transmitter shall be similar to the Low Air Pressure Transmitter, except that the performance specifications are not as severe. Differential pressure transmitters shall be provided that meet the following performance requirements:
- 1) Zero & span: (c/o F.S./Deg. F): .04% including linearity, hysteresis and repeatability.
 - 2) Accuracy: 1% F.S. (best straight line) Static Pressure Effect: 0.5% F.S. (to 100 PSIG.
 - 3) Thermal Effects: <+.033 F.S./Deg. F. over 40 Deg. F. to 100 Deg. F. (calibrated at 70 Deg. F.).
- d. Standalone pressure transmitters shall be mounted in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be installed in the panel with high and low connections piped and valved. Air bleed units, bypass valves, and compression fittings shall be provided.

E. Air Flow Measuring Stations

All airflow-measurements stations shall bear the AMCA Certified Ratings Program seal for Air Performance.

1. Piezo Ring Air Flow Measuring Stations

- a. Acceptable manufacturers: Air Monitor Corporation, Dietrich Standard, Paragon Controls, or Tek-Air.
 - 1) Substitutions: Refer to Division 01.
- b. At the inlet of each fan and near the exit of the inlet sound trap, flow measurement device shall be provided that shall continuously monitor the fan air volumes and system velocity pressure.
- c. Flow measurement device shall consist of a Piezo ring mounted on the circumference of the fan inlet throat and an inlet tap mounted on the face of the inlet cone.

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- d. For multiple fans in parallel, provide Piezo ring/pressure tap at each fan inlet and provide an air flow totalizing panel equal to Paragon FAATS-1000 Fan Array Air Flow Totalizing system. The panel shall communicate the air flow of each individual fan and the total fan array air flow to the BAS. Air flow discrepancies and fan failures shall be alarmed from the panel to the BAS.
 - e. Station shall have an accuracy within +/- 5% of actual air flow and be rated for operation from 200 to 8,000 feet/minute velocity at up to 350 deg. F.
 - f. Station shall not induce a pressure drop greater than 0.15" w.c. at 4,000 feet/minute regardless of fan inlet size.
 - g. Station shall be anodized aluminum unless noted otherwise and built in accordance with ASHRAE Standard #111 and AMCA Publication #203.
2. Thermal Dispersion Air Flow/Temperature Measurement Devices
- a. Acceptable manufacturers: Air Monitor Corporation, Ebtron, or Johnson Controls.
 - 1) Substitutions: Refer to Division 01.
 - b. Basis of Design:
 - 1) Duct/plenum mounted: Ebtron Model GTx116-P+
 - c. Provide air flow/temperature measurement devices (AFMS) where indicated on the plans.
 - d. Each AFMS shall consist of one or more sensor probes and a single, remotely mounted, microprocessor-based transmitter capable of independently processing up to 16 independently wired sensor nodes contained in one or more probe assemblies per measurement location.
 - 1) Each sensor node shall contain two individually wired, hermetically sealed bead-in-glass thermistors.
 - 2) Thermistors shall be mounted in the sensor node using a marine-grade, waterproof epoxy. Thermistor leads shall be protected and not exposed to the environment. Thermistor leads shall not be fastened to the thermistor semiconductor substrate by weld or solder connections.
 - 3) The air flow rate at each sensor node shall be equally weighted and arithmetically averaged by the transmitter prior to output. All integrated circuitry shall be temperature rated as 'industrial-grade'. Submissions containing 'commercial-grade' integrated circuitry are not acceptable.

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- 4) The temperature at each sensor node shall be arithmetically averaged or velocity weighted and averaged by the transmitter prior to output, either as field-selected by the contractor or user.
- 5) Each transmitter shall have a 16-character alpha-numeric display capable of displaying air flow, temperature, system status, configuration settings and diagnostics.
- 6) Other than the thermistor sensors, no other electronic components shall be located at the sensing node.
- 7) Devices using chip-in-glass, epoxy-coated or diode-case chip thermistors are not acceptable.
- 8) Devices with RJ-45 connections exposed to the environment or having electronic circuitry mounted in or at the sensor node are not acceptable.

e. All Sensor Probes

- 1) Each sensor node, consisting of two thermistor-sensors and their structural housing, shall independently determine the air flow rate and temperature at each measurement point.
- 2) Each sensor node shall be factory calibrated at a minimum of 16 air flow rates and 3 temperatures to standards that are traceable to the national Institute of Standards and Technology (NIST). Thermistor sensor calibrations traceable only to temperature standards are not acceptable.
- 3) Temperature accuracy shall be +/-0.14 degrees F (0.08 degrees C) over the entire operating temperature range of -20 degrees F to 160 degrees F (-28.9 degrees C to 71 degrees C).
- 4) The operating humidity range for each sensor probe shall be 0-99% RH (non-condensing). Product design shall consider direct exposure to or immersion in liquid water and temporary exposure shall not damage the sensing elements.
- 5) Each sensor or probe assembly shall not require matching to the transmitter in the field.
- 6) A single manufacturer shall provide both the air flow/temperature measuring probe(s) and transmitter for each measurement location.

f. Duct and Plenum Probes

- 1) Probes shall be constructed of extruded, gold anodized, 6063 aluminum tubes. All internal wires within the tube shall be Kynar coated. PVC insulated conductors are not acceptable.

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- 2) Sensor probe design shall be capable of providing up to 4 sensor nodes per probe.
- 3) Air flow accuracy shall be +/-2% of reading over the entire operating air flow range of not less than zero to 5,000 feet per minute (zero to 25.4 meters per second).
 - (a) Devices whose overall performance at the host controller input terminals is the combined accuracy of the transmitter and sensor probes shall demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
- 4) Each ducted sensor probe shall have an integral, U.L. listed, plenum rated cable. Cable jackets and conductor insulation shall be FEP, Teflon-FEP or Neoflon-FEP. Cables shall include a terminal plug for connection to the remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated. PVC jacketed cables of PVC insulated conductors are not acceptable with ducted sensor probes.

g. Thermal Dispersion Sensor Transmitters

- 1) The transmitter shall have an integral LCD display capable of simultaneously displaying air flow and temperature. The LCD display shall be capable of displaying individual air flow and temperature readings of each independent sensor node.
- 2) The transmitter shall be capable of field configuration and diagnostics using an on-board pushbutton interface and LCD display.
- 3) The transmitter shall have an on-off power switch and operate on 24 VAC. Isolation transformers shall not be required. Power shall be extended from local BAS panel.
 - (a) The transmitter shall use a switching power supply, fused and protected from transients and power surges.
 - (b) The transmitter shall use "watch-dog" circuitry to assure automatic reset after power disruption, transients and brown-outs.
- 4) All interconnecting pins, headers and connections on the main circuit board, option cards and cable receptacles shall be gold plated.
- 5) The operating temperature range for the transmitter shall be -20 degrees F to 120 degrees F (-28.9 degrees C to 48.9 degrees C). The transmitter shall be installed at a location that is protected from weather and water.

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- 6) The transmitter shall be capable of communicating with other devices using one of the following interface options:

- (a) Linear analog output signals for air flow and temperature: Field selectable, fuse protected and electrically isolated from all other circuitry, 0-5VDS / 0-10VDC / 4-20mA (4-wire).

- (b) RS-485: Field selectable BACnet/MS/TP, BACnet-ARCNET, Modbus-RTU or Johnson Controls N2-Bus.

BACnet devices shall provide analog variables for air flow and temperature containing individual sensor air flow rate and temperature data.

- (c) 10 Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP, Modbus-TCP and TCP/IP.

- 7) Provide dynamic link libraries and VBA functions to interface Ethernet devices to Microsoft Excel for remote monitoring of air flow and temperature using a MS Windows-based PC.

3. Static Pressure Traverse Probe

- a. Acceptable manufacturers: Air Monitor Corp., Cleveland Controls, or Paragon Controls.

- 1) Substitutions: Refer to Division 01.

- b. Duct static traverse probes shall be provided where required to monitor duct static pressure. The probe shall contain multiple static pressure sensors located along exterior surface of the cylindrical probe.

- c. Shielded Static Air Probe

- 1) A shielded static pressure probe shall be provided at each end of the building. The probe shall have multiple sensing ports, an impulse suppression chamber, and air flow shielding. A suitable probe for indoor and outdoor locations shall be provided.

F. Smoke Detectors

1. Ionization type air duct detectors shall be furnished as specified elsewhere in Division 28. for installation under Division 23. All wiring for air duct detectors shall be provided under Division 28, Fire Alarm System. Coordinate interface with BAS and Fire Alarm System.

G. Status and Safety Switches

1. General Requirements

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- a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BAS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.

2. Current Sensing Switches

- a. Acceptable manufacturers: Veris Industries.
 - 1) Substitutions: Refer to Division 01.
- b. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
- c. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
- d. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.

3. Air Filter Status Switches

- a. Acceptable manufacturers: Automated Logic, Cleveland Controls, Johnson Controls, or Siemens.
 - 1) Substitutions: Refer to Division 01.
- b. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.
- c. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
- d. Provide appropriate scale range and differential adjustment for intended service.

4. Air Flow Switches

- a. Acceptable manufacturers: Automated Logic, Cleveland Controls, Johnson Controls, or Siemens.
 - 1) Substitutions: Refer to Division 01.

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- b. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.
 - c. Acceptable manufacturers: Johnson Controls, Cleveland Controls
5. Air Pressure Safety Switches
- a. Acceptable manufacturers: Automated Logic, Cleveland Controls, Johnson Controls, or Siemens.
 - 1) Substitutions: Refer to Division 01.
 - b. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.
 - c. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.
6. Low Temperature Limit Switches
- a. Acceptable manufacturers: Johnson Controls (model A70).
 - 1) Substitutions: Refer to Division 01.
 - b. The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.
 - c. The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.
 - d. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.

3.03 OUTPUT DEVICES

A. Actuators

- 1. Acceptable manufacturers: Belimo, Johnson Controls, or Mamac
 - a. Substitutions: Refer to Division 01.
- 2. General Requirements
 - a. Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section.
- 3. Electronic Damper Actuators

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- a. Electronic damper actuators shall be direct shaft mount.
 - b. Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized Based on actuator manufacturer's recommendations for face velocity, differential pressure and damper type. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. All actuators shall have external adjustable stops to limit the travel in either direction, and a gear release to allow manual positioning.
 - c. Modulating actuators shall accept 24 VAC or VDC power supply, consume no more than 15 VA, and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for troubleshooting purposes.
 - d. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop associated fan. Two-position actuators, as specified in sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.
4. Electronic Valve Actuators
- a. Electronic valve actuators shall be manufactured by the valve manufacturer.
 - b. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.
 - c. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized Based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the sequence of operations. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.

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- d. Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
- e. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.
- f. Valves with two-position or modulating actuators shall have manual override to bypass the actuator operation and open/close valves.

B. Control Dampers

- 1. The BAS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the BAS Contractor or as specifically indicated on the Drawings.
- 2. All dampers used for throttling air flow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.
- 3. All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.
- 4. Damper frames and blades shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 60". Damper blades shall be 16-gauge minimum and shall not exceed eight (8) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. All damper bearings shall be made of reinforced nylon, stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48"x48" size shall not leak in excess of 8.0 cfm per square foot when closed against 4" w.g. static pressure when tested in accordance with AMCA Std. 500.
- 5. Airfoil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5" w.g., but no more than 4000 FPM or 6" w.g. Acceptable

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manufacturers are Johnson Controls D-7250 D-1250 or D-1300, Ruskin CD50, and Vent Products 5650.

6. One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below. Acceptable manufacturers are: Johnson Controls D-1600, Ruskin CD36, and Vent Products 5800.
7. Multiple section dampers may be jack-shafted to allow mounting of piston pneumatic actuators and direct connect electronic actuators. Each end of the jackshaft shall receive at least one actuator to reduce jackshaft twist.

C. Control Relays

1. Control Pilot Relays

- a. Acceptable manufacturers: Johnson Controls or Lectro.
 - 1) Substitutions: Refer to Division 01.
- b. Control pilot relays shall be of a modular plug-in design with retaining springs or clips.
- c. Mounting Bases shall be snap-mount.
- d. DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.
- e. Contacts shall be rated for 10 amps at 120VAC.
- f. Relays shall have an integral indicator light and check button.

D. Electronic Signal Isolation Transducers

1. Acceptable manufacturers: Advanced Control Technologies.
 - a. Substitutions: Refer to Division 01.
2. A signal isolation transducer shall be provided whenever an analog output signal from the BAS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.
3. The signal isolation transducer shall provide ground plane isolation between systems.
4. Signals shall provide optical isolation between systems.

E. External Manual Override Stations

1. External manual override stations shall provide the following:

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- a. An integral HAND/OFF/AUTO switch shall override the controlled device pilot relay.
- b. A status input to the Facility Management System shall indicate whenever the switch is not in the automatic position.
- c. A Status LED shall illuminate whenever the output is ON.
- d. An Override LED shall illuminate whenever the HOA switch is in either the HAND or OFF position.
- e. Contacts shall be rated for a minimum of 1 amp at 24 VAC.

3.04 MISCELLANEOUS DEVICES

A. Local Control Panels

1. All control panels shall be factory constructed, incorporating the BAS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch. Provide common keying for all new panels and match keying when existing panels are present.
2. Control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices-such as relays, transducers, and so forth-that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
3. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
4. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
5. All wiring shall be neatly installed in plastic trays or tie-wrapped.
6. A 120 VAC duplex convenience receptacle and required transformers shall be provided in each enclosure.

B. Power Supplies

1. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.
2. Input: 120 VAC +10%, 60Hz.

3. Output: 24 VDC.
4. Line Regulation: +0.05% for 10% line change.
5. Load Regulation: +0.05% for 50% load change.
6. Ripple and Noise: 1 mV rms, 5 mV peak to peak.
7. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.
8. A power disconnect switch shall be provided next to each power supply.

PART 3 - EXECUTION

4.01 INSTALLATION

A. Actuation / Control Type

1. Primary Equipment
 - a. Controls shall be provided by equipment manufacturer as specified herein.
 - b. All damper and valve actuation shall be electric.
2. Air Handling Equipment
 - a. All air handlers shall be controlled with a HVAC-DDC Controller
 - b. All damper and valve actuation shall be electric.
3. Terminal Equipment:
 - a. Terminal Units (ATU, UV, etc.) shall have electric damper and valve actuation.
 - b. All Terminal Units shall be controlled with HVAC-DDC Controller.

B. HVAC Input Devices - General

1. All Input devices shall be installed per the manufacturer recommendation.
2. Locate components of the BAS in accessible local control panels wherever possible.
 - a. The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, air flow stations, etc.
3. Flow Measuring Devices shall be installed in strict compliance with ASHRAE and ASME guidelines affecting non-standard approach conditions.

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4. Outside Air Sensors

- a. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.
- b. Sensors shall be installed with a rain proof, perforated cover.

5. Building Differential Air Pressure Applications (-1" to +1" w.c.)

- a. Transmitters exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
- b. The interior tip shall be inconspicuous and located as shown on the drawings.

6. Air Flow Measuring Stations

- a. Install air flow measuring stations in accordance with manufacturer's instructions at the locations indicated on the plans including clear distances to adjacent fittings, elbows, inlets, or other interference. A written report shall be submitted to the Engineer if any discrepancies exist or if installation cannot be completed per the manufacturer's recommendations.
- b. Station flanges shall be two inch to three inch to facilitate matching connecting ductwork.

7. Duct Temperature Sensors

- a. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
- b. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
- c. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.
- d. The sensor shall be mounted to suitable supports using factory approved element holders.

8. Space Sensors

- a. Mounted per ADA requirements.

9. Averaging and Low Temperature Limit Switches

- a. Install as indicated in the control diagram.

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- b. Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by at least 1 foot of sensor.
- c. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to obtain full coverage.

10. Air Differential Pressure Status Switches

- a. Install with static pressure tips, tubing, fittings, and air filter.

C. HVAC Output Devices

1. All output devices shall be installed per the manufacturer's recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, air flow stations, pressure wells, etc.
2. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.
3. Control Dampers: Shall be opposed blade for modulating control of air flow. Parallel blade dampers shall be installed for two position applications.
4. Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.
5. Electronic Signal Isolation Transducers: Whenever an analog output signal from the BAS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. Signals shall provide optical isolation between systems

4.02 TRAINING

- A. The BAS contractor shall provide the following training services:
 1. One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BAS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

4.03 COMMISSIONING

- A. Fully commission all aspects of the Building Management System work.
- B. Acceptance Check Sheet
 - 1. Prepare a check sheet that includes all points for all functions of the BAS as indicated on the point list included in this specification.
 - 2. Submit the check sheet to the Engineer for approval
 - 3. The Engineer will use the check sheet as the basis for acceptance with the BAS Contractor.
- C. ATU performance verification and documentation:
 - 1. The BAS Contractor shall test each air terminal unit for operation and correct flow. At each step, after a settling time, box air flows and damper positions will be sampled. Following the tests, a pass/fail report indicating results shall be produced. Possible results are Pass, No change in flow between full open and full close, Reverse operation or Maximum flow not achieved. The report shall be submitted as documentation of the installation.
 - 2. The BAS Contractor shall issue a report based on a sampling of the ATU calculated loop performance metrics. The report shall indicate performance criteria, include the count of conforming and non-conforming boxes, list the non-conforming boxes along with their performance data, and shall also include graphical representations of performance.
- D. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

END OF SECTION

SECTION 23-3113
SHEETMETAL DUCTWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Rectangular Metal Ducts
- B. Round Ducts
- C. Duct Sealant Material

1.02 RELATED REQUIREMENTS

- A. Division 07 - Firestopping
- B. Division 09 - Painting and Coating
- C. Section 23 05 48 - Vibration and Seismic Controls for HVAC
- D. Section 23-0593 - Testing, Adjusting, and Balancing for HVAC
- E. Section 23-0700 - HVAC Insulation
- F. Section 23 33 00 - Air Duct Accessories
- G. Section 23 36 00 - Air Terminal Units
- H. Section 23-3700 - Air Outlets and Inlets

1.03 REFERENCE STANDARDS

- A. ASHRAE Handbook - Fundamentals; 2013.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.
- F. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2014.

- G. SMACNA 1972 - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.
- H. SMACNA 1966 - HVAC Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- I. SMACNA 1767 - Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines; 2001.
- J. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- K. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.
- L. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Submit material/product data in accordance with the provisions of Division 01.
- B. Duct dimensions shown on drawings indicate inside clear dimensions. Make calculation allowances for duct requiring internal sound lining, or insulation to provide "inside clear" (IC) dimensions.
- C. Shop Drawings: Provide shop drawings of sheet metal shop ductwork, as follows:
 - 1. Draw to a scale not less than 1/4-inch to one foot
 - 2. Provide sheet sizes equal to Contract Drawings
 - 3. Show duct sizes
 - 4. Show fitting details
 - 5. Show lighting and ceiling diffusers
 - 6. Show bottom of duct elevation above finished floor
 - 7. Show all manual and motorized dampers and associated access doors.
 - 8. Show HVAC equipment, all air terminal units, and air quantities.
- D. Coordinated Shop Drawings: Provide coordinated shop drawings for sheet metal work in mechanical equipment rooms, and other congested areas listed.
 - 1. Draw to a scale of 1/2 inch to 1 foot.
 - 2. Provide sheet sizes to match Contract Drawings.

3. Show duct sizes.
 4. Show bottom duct elevations from finished floor.
 5. Show lighting, equipment, maintenance and operating clearances, HVAC piping, plumbing piping, medical gas piping, pneumatic tube system, conduit 3" and larger, and columns and beams with mounting heights.
 6. Show construction details of all fittings and connections to equipment.
 7. Show construction details of plenums and casing.
- E. Coordinated Shop Drawings shall be completed for all areas prior to installation of the major trades. The coordinated shop drawings are not required to be submitted except as noted above. A coordinated shop drawing attempt shall be submitted with any request to the owner or design team to assist with overhead coordination conflicts.
- F. Certifications: Provide a duct schedule, certified by an officer of the sheet metal fabrication subcontractor, that the ductwork conforms to SMACNA standards. For each sheet metal system furnished on the project include:
1. System name
 2. Duct material
 3. Duct gauge
 4. SMACNA rectangular reinforcement number
 5. SMACNA intermediate reinforcement number
 6. SMACNA transverse reinforcement number
 7. Rod diameter and type
 8. Sealant type and material by pressure classification
 9. Attachment method
 10. Duct system design pressure
- G. Field Conditions
1. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturer.
 2. Maintain temperature within acceptable range during and after installation of duct sealants.

1.05 QUALITY ASSURANCE

- A. Provide an installed duct system which will supply the air quantities indicated by the drawings and have the lowest possible friction loss with the least possible leakage loss. System static pressure loss for each system shall not exceed that which is indicated in the equipment schedule as external static pressure or in the fan schedule as static pressure and shall include the losses of all accessories. Friction losses shall be minimized by reduction in the number of offsets and elbows by pre-planning the duct system installation and coordination with other trades to prevent interferences. Maintain access to accessories requiring maintenance, service, and inspection. Radius elbows are preferred for turns to minimize friction, noise, and vibrations.
- B. Provide and/or construct materials, ductwork, joints, transformations, splitters, dampers, and access doors as specified herein for the sheet metal ductwork as shown on drawings.
- C. SMACNA Manual: Sheet Metal Tradesman shall have access on the construction site to "HVAC Duct Construction Standards". Comply with applicable provisions of the SMACNA Manual and more stringent requirements of this specification.
- D. Quality control involves not only the general performance requirements for air ducts, but also quality workmanship which includes layout pre-planning so that offsets, rises, falls, elbows, fittings, etc., are minimized or eliminated. General performance requirements for ducts include:
 - 1. Dimensional stability (shape deformation and strength)
 - 2. Containment of the air being conveyed (leakage control). See Part 3 of this specification for leakage testing.
 - 3. Vibration (fatigue and appearance)
 - 4. Noise (generation, transmission, or attenuation)
 - 5. Exposure (to damage, weather, temperature extremes, flexure cycles, wind, corrosive atmospheres, biological contamination, flow interruption or reversal, underground or other encasement conditions, combustion, or other in-service conditions)
 - 6. Support (alignment and position retention)
 - 7. Seismic restraint
 - 8. Thermal conductivity (heat gain or loss and condensation control)
- E. Provide galvanized duct materials which meet applicable requirements of local and state codes, whichever is the most stringent.

- F. Support ductwork in accordance with applicable requirements of local and state codes and details on drawings.
- G. Emboss fittings with material gauge, manufacturer, and type material.
- H. Sealers, liners, pre-insulated jackets and flexible ducts shall comply with a flame spread rating of 25 or less and a smoke developed rating of not over 50.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Sheet metal ductwork, angles, bar slips, hangers, and straps: Galvanized, prime quality steel sheets.
- B. Screws: Cadmium plated.
- C. Joint and Seam Sealers:
 - 1. Acceptable Manufacturers: Carlisle Hard Cast Duct Sealants; Design Polymeric; Ductmate Industries; Childers (HB Fuller Construction Products).
 - 2. Meets Seal Class A.
 - 3. Water resistant, mold and mildew resistant
 - 4. Suitable for indoor use and outdoor use with UV inhibitors.
 - 5. Surface burning characteristics: Flame spread of zero and smoke developed of zero when tested in accordance with ASTM E84.
 - 6. UL Listed and Labeled to UL181.
 - 7. Suitable for metal duct, duct fabric and flex duct.
 - 8. For Pressure Classifications 2" and less, indoors, use Carlisle Flex-Grip 550 for joints and seams.
 - 9. For Pressure Classifications 6" to 10", indoors and outdoors, use fiber reinforced Carlisle Versa-Grip 181 for joints and seams.
 - 10. For bolted duct joints and connections (Nexus, Ductmate, Elgen, TDC, TDF), use Ductmate DM440 Butyl Gasket Sealing Tape with Iron Grip 601 sealant at corner joints.
 - 11. For all outdoor duct joints and seams, use Carlisle Versa-Grip 181, fiber reinforced with UV inhibitors, for all pressure classifications on all joints and seams.

12. For active live air flow systems, use Carlisle Aluma-Grip AFT-701, heavy-duty rolled mastic sealant on joints and seams.
13. Pressure sensitive foil tape is not acceptable and shall not be used as a duct joint sealer.

D. Duct Sealing:

1. All longitudinal and transverse joints, seams, taps, spin-ins, branch connections, access doors, access panels, duct connections to equipment and duct sidewall penetrations, regardless of pressure classification, shall be sealed with duct sealer. Follow SMANCA Table 1-2, Seal Class A for all supply, return, exhaust, relief, and make-up air ductwork.
2. See Leakage Testing of Installed Systems requirements in Part 3.

E. Sheetmetal and air duct accessories: As specified in Section 23 33 00.

2.02 PRESSURE CLASSIFICATION

- A. Ductwork where maximum dimension is less than 97" shall be constructed based on applicable pressure classification in accordance with SMACNA Manual including sheetmetal gauge, reinforcement gauge and spacing.
- B. Construct the following for 1" pressure classification, Table 1- 4:
 1. Supply ductwork downstream of air terminal units
 2. Low pressure supply, return, and outside air ductwork at fan coil units
- C. Construct the following for 2" pressure classification, Table 1- 5:
 1. Return ductwork
 2. Exhaust ductwork
 3. Make-up air ductwork
 4. Supply ductwork downstream of single zone air handling units
 5. Supply ductwork to reheat coils
- D. Construct the following for 6" w.g. pressure classification Table 1-8:
 1. Supply ductwork and plenums downstream of supply fans up to air terminal units

2.03 RECTANGULAR DUCTWORK

A. Transverse Joints:

1. "S" and drive construction for 1" and 2" w.g. pressure classification.
 - a. Provide duct gauge and reinforcing angles in accordance with Table 1-11
 2. Duct Connection System: Connection system as manufactured by Ductmate or Nexus shall incorporate gasketed joints, metal cleats and bolted corners. Minimum metal gauge shall be 24 gauge. Connection systems may be used for all pressure classifications.
 3. For pressure classifications above 2", use double "S" joint up to 30" and companion angle or manufacturer's connection system above 30".
- B. Longitudinal Seams: Pittsburgh Lock
- C. Transitions:
1. Do not exceed 1" in 7" of slope for increase-in-area transitions.
 2. Do not exceed 1" in 4" of slope for decrease-in-area transitions, 1" in 7" is preferable.
 3. Do not exceed 45 degrees on the entering or leaving side for angle of transitions at connections to equipment without the use of approved turning vanes.
- D. Elbows:
1. Fabricate ells using one of the following specifications: The fabrication methods are listed in order of preference. Use radius elbows where ever possible. Use square elbows only when available space prevents the use of radius elbows.
 - a. Unvaned, long radius elbow with the throat radius equal to 3/4 of the width of the duct and with a full heel radius.
 - b. Six inch throat radius with full radius, single thickness vanes and full heel radius. Maximum unsupported length of vanes shall be 36". Securely fasten vanes to runners. Secure vanes in stable position. Construct vane edges to project tangents parallel to duct sides.
 - c. Square elbows with airfoil, double thickness turning vanes.
 2. Turning vanes:
 - a. Acceptable manufacturers: Aero Dyne
 - b. Substitutions: Not permitted.
 - c. True airfoil design; smoothly-rounded entry nose with extended trailing edge. Generated sound power level shall not exceed 54 decibels in band 4 at 2000 FPM in a 24"x24" duct.

- d. Fabricate assemblies with Aero Dyne Co. side rails; install vanes on design centers of 2.4 inches across the full diagonal dimension of the elbow.
- e. Submit Aero Dyne product and performance data for review.

E. Branch Connections:

- 1. Pressure classification 2" and less:
 - a. Rectangular branch from rectangular main: 45 degree entry with all corners closed as shown in Figure 2-8
 - b. Round branches: Spin-in fitting without scoop.
 - c. Parallel flow branches: See Figure 2-7.
 - d. Space duct joints to avoid cutting them for branch take offs and outlet collars.
- 2. Pressure classification above 2":
 - a. Round branches: Conical round fittings only.
 - b. Rectangular branch from rectangular main: 45 degree entry with all corners closed as shown in Figure 2-8
 - c. Parallel flow branches: See Figure 2-7.
 - d. Space duct joints to avoid cutting them for branch take offs and outlet collars.

2.04 ROUND DUCTWORK

A. Applicable for pressure classification above 2".

B. Round Duct (Spiral Pipe) and Fittings:

- 1. Manufactured from galvanized steel meeting ASTM A653/A653M. Construction shall be in accordance with SMACNA HVAC Duct Construction Standards.
- 2. All spiral ducts shall bear the AMCA Certified Ratings Program seal for Air Leakage.
- 3. Use appropriate seams made to eliminate leakage based on pressures for which system has been designed. Longitudinal seam duct to have fusion welded butt seam.
- 4. Fittings and couplings shall have minimum gauges specified by SMACNA Manual.
- 5. Fittings shall have continuous welds along all seams. Divided flow fittings shall be manufactured as separate fittings, not as tap collars welded into spiral duct sections.

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6. Ninety degree tees (conical) and 45 degree laterals (wye) up to and including 12" diameter tap size to have radiused entrance into the tap, produced by machine or press forming. Entrances to be free of weld build-up, burrs, or irregularities.
 7. Elbows in diameters 3" thru 8" shall be two section stamped elbows. Other elbows shall be gored construction with all seams continuous welded. Fabricate to center line radius of 1.5 times the cross sectional diameter. Elbows, not die-stamped, shall be fabricated as follows:
 - a. Less than 30 degree angle: minimum 2 gores
 - b. Between 30 thru 60 degrees: minimum 3 gores
 - c. Over 60 degrees: minimum 5 gores
 8. Two piece mitered elbows shall not be used.
 9. Tees shall be conical. Saddle taps or straight tees shall not be used.
 10. The leading edge of all vanes in ducts over 20" diameter shall be hemmed with 1/2" foldback. Turning vanes in ducts over 24" shall be reinforced by stays or sectional construction to limit unsupported length to 24". Vanes shall be a minimum of 20 gauge.
 11. Reduction of divided flow fittings to conical span section in the 36 common reductions in sizes 4" thru 22".
 12. Spun bellmouth connections are to be used at each round take-off from plenum.
 13. Galvanized areas damaged by welding to be coated with corrosion resistant aluminum paint.
- C. Couplings for Round Medium-Pressure Duct (over 2" w.g.):
1. Pipe-to-pipe joints shall be sleeve couplings, reinforced by rolled beads.
 2. Pipe-to-fitting joints shall be slip-fit of projecting collar fitting into pipe.
 3. Insertion length of sleeve coupling and fitting collar shall be 2" minimum.

PART 3 - EXECUTION

3.01 INSTALLATION, APPLICATION, ERECTION

- A. Do not exceed 45 degrees for easement transition angle.
- B. Seal all transverse and longitudinal joints and seams and duct wall penetrations with approved sealer in accordance with manufacturer's directions regardless of pressure class.

- C. Counterflash ductwork penetrating roof.
- D. Support round ducts from building structure with galvanized steel hangers in accordance with SMACNA. Secure hangers to masonry portion of building by means of inserts or other acceptable anchors.
- E. Where appropriate based on duct weight, support rectangular ducts by minimum, 1" x 18 gauge, galvanized band iron or minimum 3/8" galvanized rod hangers attached to reinforcing angles and spaced same as reinforcing angles. Design hangers, reinforcing angles and other components to support weight of duct and insulation. Secure hangers to concrete beam or slab by adequately sized inserts, anchor shield and bolt, toggle bolt, or expansion bolt.
- F. Attach hangers to ductwork using sheet metal screws.
- G. Space hangers approximately 8' along the duct for ducts under 60". For ducts over 60" and larger and heavier sections, such as welded duct and sound absorbers, space hangers at approximately 4' intervals.
- H. Hangers and bracing used with ductwork shall be galvanized.
- I. Provide smooth insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. Provide metal collar equivalent in depth to insulation thickness. Access door locks and damper handles shall be free from mastic or sealant.
- J. In addition to the requirements above, add supplemental bracing as necessary to prevent sagging and drumming, and/or vibration.

3.02 CLEANING

- A. Clean mechanical system thoroughly to assure all foreign matter and dirt is removed.

3.03 AIR MOVING EQUIPMENT OPERATION DURING CONSTRUCTION

- A. The use of new or existing air handling units, fans, or other permanent air moving equipment during construction is prohibited unless approved by the owner in writing. If approved for use during construction, the following procedures shall be followed:
 - 1. The contractor shall protect the interior of all ductwork, air handling units, and other equipment from the accumulation of dirt and dust and other contaminants. If the permanent equipment cannot be adequately protected, temporary air moving/ conditioning equipment and distribution systems shall be utilized as required for finishing trades.
 - 2. Provide all specified filters in equipment to be operated as well as temporary filters on all return and exhaust air grilles, open ductwork, and transfer openings in the work area.

3. The contractor shall remove all filters used during construction and replace them with new filters prior to test and balance work and prior to substantial completion.
4. If the ductwork and/or equipment is found to be contaminated at any point during construction, an independent NADCA certified contractor shall be retained to clean the ductwork and/or equipment at the contractors expense. Refer to Section 23 01 30.51.
5. System operating temperatures shall be maintained to avoid condensation on ductwork and equipment surfaces. New or existing insulation found damaged shall be replaced.
6. Coordinate use of air handling equipment with ICRA plan, if applicable. Maintain required pressure relationships in construction areas adjacent to occupied areas.

3.04 LEAKAGE TESTING OF INSTALLED SYSTEMS

- A. Test duct for leakage in accordance with SMACNA HVAC Air Duct Leakage Test Manual. Use prescribed test kit containing test blower, two U-tube manometers and calibrated curve attached to the orifice tube assembly.
- B. Pressure testing shall include taps/take-offs to air terminal units in medium pressure ductwork and taps/take-offs to air devices in supply, return, and exhaust ductwork.
- C. Pressurize all installed duct systems for each pressure class to maximum pressure for fabrication classification. The leakage amount shall not exceed the allotted amount for the pressure class or the allotted amount for that portion of the system as follows:
 1. 1" Pressure Class - Leakage Class 6; Max. Leakage Factor - 6.0 CFM/100 SF
 2. 2" Pressure Class - Leakage Class 6; Max. Leakage Factor - 9.4 CFM/100 SF
 3. 1" and 2" Pressure Class exhaust ductwork connected to or serving fume hoods, bio-safety cabinets, chemical or hazardous storage rooms, smoke removal/purge systems, laboratory spaces, isolation rooms, bronchoscopy rooms, and nuclear medicine rooms shall be construction and tested as follows:
 - a. 1" Pressure Class - Leakage Class 3; Max. Leakage Factor - 3.0 CFM/100 SF
 - b. 2" Pressure Class - Leakage Class 3; Max. Leakage Factor - 4.7 CFM/100 SF
 4. 6" Pressure Class - Leakage Class 3; Max. Leakage Factor - 9.6 CFM/100 SF
- D. All ductwork shall be leak tested first before being enclosed in a shaft or above other inaccessible areas.
- E. Correct leaks found in excess of allowable limits. Retest until acceptable leakage is witnessed.

- F. Have test results available for review on a progressive and final basis. Include all test results in project closing file along with name, signature, and date of independent witness to testing. Test results shall show preliminary and final test results and include all calculations used to determine system compliance with the maximum specified leakage rate.

3.05 AIR TEST AND BALANCE

- A. Prepare the system for tests as specified in Section 23-0593 - Testing, Adjusting, and Balancing for HVAC and correct deficiencies found by the Test and Balance firm.
- B. Duct dimensions shown on drawings indicate inside clear dimensions. Make calculation allowances for duct requiring internal sound lining, or insulation to provide "inside clear" (IC) dimensions.

END OF SECTION

SECTION 23-3300
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fire dampers.
- B. Smoke dampers.
- C. Combination fire and smoke dampers.
- D. Flexible duct
- E. Volume control dampers.

1.02 RELATED REQUIREMENTS

- A. Division 07: Firestopping.
- B. Section .23 05 48 - Vibration Isolation and Seismic Control for HVAC
- C. Section 23-3113 - Sheetmetal Ductwork.
- D. Section: 23 36 00 - Air Terminal Units

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- B. SMACNA 1966 - HVAC Duct Construction Standards; 2005.
- C. UL 181 - Factory-Made Air Ducts and Air Connectors; 2013.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- G. AMCA 511 - Certified Ratings Program-Product Rating Manual for Air Control Devices; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Provide product data and information in accordance with the provisions of Division 01.

- B. Product Data: Submit manufacturer's product data for review. Include electrical characteristics and connection requirements where applicable.
- C. Project Record Drawings: Record actual locations of volume dampers, rated dampers, access doors, and test holes.

PART 2 - PRODUCTS

2.01 FIRE DAMPERS

- A. Acceptable manufacturers: Air Balance, Greenheck, Ruskin, Nailor, or Pottorff
- B. Fabricate in accordance with NFPA 90A, UL 555, and as indicated.
- C. Material: Galvanized steel or 304 stainless steel to match adjacent ductwork.
- D. Dampers shall be of stainless steel material where required for corrosion protection, non-ferrous construction, moisture laden ducts and high humidity applications.
- E. Dampers shall be curtain or multi-blade type, 1-1/2 hour rated, suitable for horizontal or vertical mounting. Blades for curtain type dampers shall be stored out of the airstream.
- F. Dampers shall be dynamic rated for closure against airflow up to 2000 FPM in low pressure systems and up to 4000 FPM in medium pressure systems.
- G. Dampers shall have a UL 555 differential pressure rating of 4 in. wg.
- H. Provide damper with fusible link causing the damper to lock in the closed position at 165 degrees F.
- I. Provide manufacturer's round to horizontal duct adapter as required.
- J. Maximum pressure drop shall be as follows:
 - 1. Damper pressure drop shall not exceed 0.05 in. w.g. at 1500 FPM or 0.10 in w.g. at 2000 FPM.
- K. Dampers shall bear the AMCA Certified Ratings Seal for Air Performance in accordance with AMCA 511.

2.02 SMOKE DAMPERS

- A. Acceptable manufacturers: Air Balance, Greenheck, Ruskin, Nailor, or Pottorff
- B. Fabricate in accordance with NFPA 90A, UL 555S, and as indicated.
- C. Dampers: Single or multi-blade type with airfoil blades, automatically operated by 120V electric actuator mounted outside the airstream unless noted otherwise. Actuator shall be adequately sized to open the damper within 15

seconds. Blades in low velocity/low pressure applications may be of the triple vee-groove type conforming to the air pressure drop criteria and leakage requirements.

- D. Dampers shall be Class 1 leakage rated and be dynamic rated for closure against airflow up to 2000 FPM in low pressure systems and up to 4000 FPM in medium pressure systems and at elevated temperatures of 250 degrees F minimum. Blade seals shall be silicone rubber.
- E. Provide two-position actuator with resettable link. Damper shall fail normally closed.
- F. Provide each damper with an end switch to relay damper open/closed position.
- G. Provide each damper with a remote test switch installed above the ceiling, accessible and adjacent to the damper.
- H. Damper air path dimensions shall be oversized compared to duct dimensions as follows:
 - 1. Damper width = duct width + 2"
 - 2. Damper height:
 - a. Ducts 12" high and less: Damper height = duct height + 4"
 - b. Ducts 13" to 24" high: Damper height = duct height + 3"
 - c. Ducts greater than 24" high: Damper height = duct height + 2"
- I. Provide 45 degree transitions between duct and oversized damper.
- J. Provide manufacturer's round to horizontal duct adapter as required.
- K. Damper pressure drop shall not exceed 0.15 in. w.g. at 1500 FPM or 0.25 in. w.g. at 2200 FPM.
- L. Dampers shall bear the AMCA Certified Ratings Seal for Air Performance in accordance with AMCA 511.
- M. Where required by the installation and service, stainless steel smoke dampers shall be installed for corrosion protection, non-ferrous construction, moisture laden ducts and high humidity applications.

2.03 COMBINATION FIRE AND SMOKE DAMPERS

- A. Acceptable manufacturers: Air Balance, Greenheck, Ruskin, Nailor, or Pottorff
- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

- C. Dampers: Single or multi-blade type with airfoil blades, 1-1/2 hour rated, automatically operated by 120V electric actuator mounted outside the airstream unless noted otherwise. Actuator shall be adequately sized to open the damper within 15 seconds.
- D. Dampers shall be Class 1 leakage rated and be dynamic rated for closure against airflow up to 2000 FPM and 4" w.g. in low pressure systems and up to 4000 FPM and 6" w.g. in medium pressure systems and at elevated temperatures of 250 degrees F minimum. Blade seals shall be silicone rubber.
- E. Provide two-position actuator with resettable link causing the damper to close at 165 degrees F. Damper shall fail normally closed.
- F. Provide each damper with an end switch to relay damper open/closed position.
- G. Provide each damper with a remote test switch installed above the ceiling, accessible and adjacent to the damper.
- H. Damper air path dimensions shall be oversized compared to duct dimensions as follows:
 - 1. Damper width = duct width + 2"
 - 2. Damper height:
 - a. Ducts 12" high and less: Damper height = duct height + 4"
 - b. Ducts 13" to 24" high: Damper height = duct height + 3"
 - c. Ducts over 24" high: Damper height = duct height + 2"
- I. Provide 45 degree transitions between duct and oversized damper.
- J. Provide manufacturer's round to horizontal duct adapter as required.
- K. Damper pressure drop shall not exceed 0.15 in. w.g. at 1500 FPM or 0.25 in. w.g. at 2200 FPM.
- L. Dampers shall bear the AMCA Certified Ratings Seal for Air Performance in accordance with AMCA 511.
- M. Where required by the installation and service, stainless steel fire smoke dampers shall be installed for corrosion protection, non-ferrous construction, moisture laden ducts and high humidity applications.

2.04 SLEEVES FOR RATED DAMPERS

- A. Unless otherwise required by the authority having jurisdiction, sleeves for fire dampers, smoke dampers and combination fire and smoke dampers shall be provided by the damper manufacturer and be of rigid type construction recommended in SMACNA

Publication for "Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems", Fifth Edition. Install dampers in minimum 20 GA. sleeves, or thicker if required by duct size or UL Listing. Provide minimum 18" long sleeves. Coordinate required sleeve length with wall and floor thickness and U.L. Listing for damper type and installation.

- B. Duct connections to sleeves shall be of the breakaway type.
- C. Install 1-1/2"x1-1/2"x 16 GA. minimum angles on four sides of sleeves and both sides of wall. Fasten angles to sleeve only. Do not fasten to the wall.

2.05 DUCT ACCESS DOORS

- A. Acceptable manufacturers: Ruskin, SEMCO, Greenheck, Ward Industries, or DuctMate.
 - 1. Substitutions: Refer to Division 01.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- C. Duct access doors shall have a leakage classification ratings of 3" w.g. positive and 2" w.g. negative for duct construction of 2" and less. Duct access doors shall have a leakage classification rating of 10" w.g. positive and 10" w.g. negative for duct construction of 4" w.g. and greater.
- D. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, provide minimum 1 inch (25 mm) thick insulation with minimum 24 gauge sheet metal cover on each side.
 - 1. Less Than 12 inches (300 mm) Square: Secure with sash locks.
 - 2. Up to 18 inches (450 mm) Square: Provide two hinges and two sash locks.
 - 3. Up to 24 x 48 inches (600 x 1200 mm): Three hinges and two compression latches with outside and inside handles.
 - 4. Larger Sizes: Provide an additional hinge.
 - 5. Latches shall permit easy removal of access door while maintaining positive closing and minimum leakage. Provide continuous sponge rubber gaskets for all doors.
- E. Provide insulated doors in ductwork for access to service equipment such as airflow measuring stations (each side), casing mounted coils (each side), control dampers, duct mounted coils (each side), duct mounted smoke detectors, humidifiers, rated dampers, and elsewhere as noted on drawings.
- F. Size access doors as follows:

1. Duct sizes under 12": Door sized sufficient to service equipment or replace fusible link.
 2. Duct sizes 12" to 20": 12"x12" door.
 3. Duct sizes 20" to 36": 18"x18" door.
 4. Duct sizes above 36": 24"x24" door.
- G. Provide reinforced wire glass view windows (min. 12"x12") in access doors at humidifiers.
- H. Mount doors in rigid frame of at least 22 gauge formed galvanized steel or aluminum.
- I. Use angle iron bracing as required to make the door frame a rigid assembly.
- J. In accordance with NFPA 90A, identify each access door with minimum 1/2" high printed or stenciled letters as 'Fire Damper', 'Smoke Damper', or 'Combination Fire/Smoke Damper'.

2.06 DUCT TEST PORTS

- A. Temporary Test Port: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps. Repair insulation and vapor barrier.
- B. Permanent Test Port: Factory fabricated, air tight flanged fittings with screw cap equal to Carlisle PTP-1. Provide extended neck fittings to clear insulation.

2.07 FLEXIBLE DUCT

- A. Acceptable manufacturers: Atco, Flexmaster USA, Hart & Cooley, or Thermaflex.
1. Substitutions: Refer to Division 01.
- B. Characteristics of flexible duct to air terminals:
1. Approved as UL 181, Class 1 air duct, with metalized vapor barrier.
 2. Meet requirements of ASTM C1071.
 3. Flame spread less than 25; smoke developed rating less than 50.
 4. Thermal conductance: minimum R-6.
 5. Perm rating: 0.05 perms per ASTM E96, Method A.
 6. Provide a minimum of three feet of flexible duct upstream of diffusers. Do not exceed six feet of length.

7. Flexible duct shall meet standards of local building code.
- C. Seal off the insulation jacket at its ends and at joints with mastic, hardcast, or similar material. Replace flex if jacket is punctured.
- D. Complete insulation coverage up to the diffuser neck connection.
- E. Do not route flexible duct through corridor walls or fire or smoke rated partitions, barriers, or walls.
- F. No bends shall be made in flexible duct with the center line radius less than one and one-half duct diameter and only one bend may occur per four foot length of duct material.

2.08 FLEXIBLE DUCT CONNECTIONS

- A. Acceptable manufacturers: Carlisle, Durodyne, Elgen, or DuctMate.
 1. Substitutions: Refer to Division 01.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip with 10" w.g. positive and negative pressure rating.
 1. Fabric: NFPA 90A compliant, UL listed fire-retardant neoprene coated woven glass fiber fabric, minimum 28 oz. density.
 - a. Net Fabric Width: Approximately 3 inches (75 mm) wide.
 2. Metal: 3 inches (75 mm) wide, 24 gauge, 0.0239 inch (0.61 mm) thick galvanized steel. Provide aluminum or stainless steel metal as required to match ductwork material.

2.09 VOLUME CONTROL DAMPERS

- A. Acceptable manufacturers: Louvers & Dampers, Greenheck, McGill Airflow, Ruskin, or SEMCO.
 1. Substitutions: Refer to Division 01.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- C. Damper and blade material shall be of the same material as the duct in which it is installed.

- D. Where manual or motorized volume dampers and control dampers are installed in outside air ducts in coastal climates subject to salt air, provide dampers of aluminum construction with appropriate supports and handles.
- E. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch (150 x 760 mm).
 - 1. Fabricate for duct sizes up to 6 x 30 inch (150 x 760 mm).
 - 2. Blade: 22 gauge, minimum.
 - 3. Frame: 18 gauge, minimum.
- F. Multi-Blade Damper: Fabricate of opposed blade pattern with 3V or airflow shaped blades and maximum blade sizes 8 x 72 inch (200 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 - 1. Blade: 18 gauge, 0.0478 inch (1.21 mm), minimum.
- G. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
- H. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install accessories in locations specified and as shown on drawings in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 23-3113 for duct construction and pressure class.
- B. Provide insulated doors in ductwork for access to service equipment such as airflow measuring stations (each side), casing mounted coils (each side), control dampers, duct mounted coils (each side), duct mounted smoke detectors, humidifiers, rated dampers, and elsewhere as noted on drawings.

- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges. Install in accordance with manufacturer's written requirements and UL Listing.
- E. At fans and motorized equipment associated with ducts, provide flexible duct connections between equipment discharge and adjoining ductwork or plenum.
- F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- G. Provide balancing dampers at all points on supply, return, and exhaust systems where branches are taken from larger ducts.
- H. Where diffusers or grilles and registers are not provided with volume dampers, install spin-in fitting with balance damper in duct run-out.
- I. Provide all screws, bolts, nuts, inserts, and material required for attaching sheetmetal to duct, walls, floors, and ceilings.

3.03 TESTING

- A. Check work for satisfactory installation and performance.
- B. Insure that adequate access does in fact exist for rated dampers, that damper blade movement is not restricted, and that damper operator motors are not hindered in operation by proximity to walls or other objects.
- C. Check duct connections at access doors for air leakage or condensation. Correct deficiencies found.

END OF SECTION

SECTION 23-3418
CENTRIFUGAL EXHAUST FANS - ROOF

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Roof Mounted Centrifugal Fans

1.02 RELATED REQUIREMENTS

- A. Section 23-0500 - Common Work Results for HVAC
- B. Section 23-0513 - Common Motor Requirements for HVAC Equipment
- C. Section 23 05 48 - Vibration Isolation and Seismic Control for HVAC
- D. Division 26: Electrical

1.03 REFERENCE STANDARDS

- A. AMCA 99 - Standards Handbook
- B. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
- C. AMCA 211 - Certified Ratings Program - Product Rating Manual for Fan Air Performance
- D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans
- E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data
- F. AMCA 311 - Certified Ratings Program - Product Rating Manual for Fan Sound Performance
- G. ANSI/ABMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings

1.04 SUBMITTALS

- A. Submit manufacturer's product data for review in accordance with the provisions of Division 01..
- B. Fan curves shall include entire range of RPM curves, scheduled operating point, brake horsepower, motor horsepower, and sound performance data.

1.05 QUALITY ASSURANCE

- A. Certify fans performance in accordance with AMCA Certified Air and Sound Rating Criteria, Standards 210, 211, and 301.

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- B. Sound Power data: Rated in accordance with AMCA 300.
- C. All fans shall bear the AMCA Certified Ratings Program seal for Air and Sound Performance.
- D. Fans shall have a Fan Efficiency Grade (FEG) in compliance with AMCA 205. Total fan efficiency at design point of operation shall be within 15% of the max total fan efficiency.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data as specified in Division 01.
- B. Include instructions for lubrication, motor, spare parts list, and wiring diagrams.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Protect motors, shafts, and bearings from weather and construction dust.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Acme, Carnes, Greenheck, Jenco, Loren Cook, or PennBarry.
- B. Substitutions: Refer to Division 01.

2.02 ROOF MOUNTED FANS

- A. Drives: Variable pitch V-belt drives or direct driven as scheduled.
- B. Housings: Hinged, heavy gauge aluminum enclosing motor outside airstream.
- C. Motor: Ball bearing type, designed for heavy duty vertical and horizontal mounting. Isolate motors and fans from base with rubber isolators. Select motor such that motor BHP does not exceed nameplate at rated conditions.
- D. Fans: Centrifugal type, statically and dynamically balanced.
- E. Provide:
 - 1. Lubricated lifetime sealed ball bearings.
 - 2. Spark proof constructions with explosion proof motor suitable for Class I, Group C, Division 33 service, where scheduled on drawings.
 - 3. Gravity dampers where not specified to be motorized.

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4. Motorized backdraft dampers interlocked as shown in control drawings.
5. Disconnect switch on 3-phase units furnished under Division 26, unless noted as a fan accessory on fan schedule.
6. Bird screen around fan discharge.
7. Where required, prefabricated, 1" thick fiberglass insulated, roof curb of same material as fan housings and manufactured by the fan manufacturer. Provide minimum 18" high curb; see Mechanical Schedules on drawings.
8. Refer to architectural drawings or existing conditions for roof pitch.
9. Upblast housing where shown on drawings.

PART 3 - EXECUTION

3.01 ROOF MOUNTED FANS

- A. Secure fans to curbs with stainless steel screws and fasteners..
- B. Connect duct to fans to allow for straight and smooth airflow.
- C. Provide flexible connections (minimum of 4") between fan and duct.
- D. Install fan level - plus or minus 5 degrees in vertical. Final installation to be free of all leaks both from fan interior and roof-to-curb interface.

3.02 START-UP, TESTING, DEMONSTRATION

- A. Start-up fans after checkout to ensure proper alignment and phased electrical connections.
- B. Test fans individually and as part of a system, where required, in accordance with Section 23-0500 - Common Work Results for HVAC.
- C. Where required, ensure that fans are interlocked with supply and/or return fans and with fire detection and control system.
- D. Demonstrate and instruct operation to maintenance personnel.

END OF SECTION

**SECTION 23-3433
AIR CURTAINS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air curtains with electric heat.

1.02 RELATED REQUIREMENTS

- A. Section 23-2113 - HVAC Piping.
- B. Section 26 27 17 - Equipment Wiring.

1.03 REFERENCE STANDARDS

- A. AMCA 220 - Laboratory Methods of Testing Air Curtains for Aerodynamic Performance Ratings; 2012.
- B. AHRI 410 - Forced-Circulation Air- Cooling and Air-Heating Coils

1.04 QUALITY ASSURANCE

- A. The contract documents indicate the basis of design manufacturer model, size profiles, and dimensional requirements of the air curtains. See schedules.
- B. Comply with all applicable ordinances, codes, and standards as required by the authorities having jurisdiction.
- C. Units shall be UL Listed and Labeled.
- D. Comply with NFPA 70, National Electrical Code.
- E. ETL Listed (Tested in accordance with ANSI/UL 1995).
- F. All air-curtain units shall bear the AMCA Certified Ratings Program seal for Air Performance.
- G. All air-curtain units shall bear the AMCA Certified Ratings Program seal for Air and Sound Performance.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for products specified in this section; indicate options specified. Include equipment tags, capacities, air flow, air velocities, noise ratings, motor quantity and horsepower, electrical ratings, unit weight, mounting requirements.

1. Wiring diagrams: Power, signal and control wiring. The wiring diagram must indicate a clear distinction between the manufacturer's factory furnished and installed wiring, and the required contractor furnished and installed wiring for all power, signal and control wiring and accessories.
- C. Manufacturer's Instructions: Printed installation instructions for each product specified.
- D. Shop Drawings: Indicate installation and connection details for air curtains.
- E. Operation and Maintenance Data: Manufacturer's printed instructions for operating and maintaining air curtain components.
- F. Warranty Documents.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products of this section in manufacturer's unopened packaging until installation.
- B. Maintain dry, temperature controlled storage area for products in this section until installation of products.

1.07 COORDINATION

- A. Coordinate layout and installation of air curtains, mounting system and all components associated with the air curtains with other trades and Specification Divisions.
- B. Notify the architect and engineer of any coordination conflicts prior to installation of the air curtain or other associated parts and accessories prior to installation. Any installation that is commenced or completed without coordination is subject to rejection of the work and must be redone as required to meet the intent of the contract documents.

1.08 WARRANTY

- A. See Section 01-7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Berner International, Mars Air Systems, Powered Aire, or TMI.

2.02 AIR CURTAINS

- A. Product Description: Self-contained, electrically-operated, air curtain for mounting at head of door openings.
 1. Maximum Mounting Height: 7 feet (2.1 m).
 2. Maximum Door Width: 6 feet (1.8 m).

3. Directional airfoil vanes to deflect air stream by +/- 20 degrees, factory set.
- B. Housing:
1. Material: 18 gauge Galvanized steel.
 2. Factory-provided mounting brackets.
 3. Finish: Painted epoxy.
 4. Color: Selection by architect.
- C. Air Inlet Grille: Inlet screen shall be 20 gauge perforated stainless steel.
- D. Blower Assembly: Heavy-duty, ODP or TEAO multi speed motor with integral thermal overload protection; forward curved galvanized centrifugal fans, double inlet, double width with shielded ball bearing supports of shaft. Discharge nozzle shall be a high efficiency discharge plenum and create a positive seal with directional air foil vane.
- E. Performance: Tested in accordance with AMCA 220.
1. Average Outlet Velocity: as scheduled; uniform across entire length of the discharge nozzle area.
 2. Air Flow: as scheduled.
 - a. Volume Adjustment: Manually set potentiometer speed controller.
- F. Control: ON/OFF/Auto control; air curtain turns on when door is opened and off when door is closed.
- G. Operating Noise Level: 54 dBA.
1. Measured 10 feet (3 m) from unit.
- H. Utility Requirements: As shown on drawings.
- I. Electric Heat: 14 kW, with temperature limit controller.
- J. Electric Heater Assembly: Helical nickel-chrome resistance wire coil heating elements with refractory ceramic support bushings, capacity scheduled on the drawings.
1. Controls: Start fans before electric elements are energized.
- K. Thermostat: Wall-mounted, 24 volt operation. Provide remote on/off/auto control from FMS.
- L. Accessories:
1. Disconnect

2. Automatic Door Switch
3. Adjustable time delay
4. Remote High/Off/Low selector switch
5. HOA Switch
6. Two inch thick lifetime cleanable filter.

M. Products:

1. Architectural Air Curtains:
 - a. Berner International Corp; Architectural High Performance
10: www.berner.com/#sle.
2. Commercial Air Curtains:
 - a. Berner International Corp; Commercial High Performance
10: www.berner.com/#sle.
3. Industrial Air Curtains:
 - a. Berner International Corp; Industrial Direct Drive: www.berner.com/#sle.
 - b. Substitutions: See Section 01-6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that required utilities are in correct location and are of correct capacities for specified products.
- B. Verify that mounting surfaces have sufficient strength to support units.
- C. Verify that space is ready for installation of units.
- D. Verify clearances required to maintain the units and to protect combustible materials.

3.02 INSTALLATION

- A. Install air curtains in accordance with shop drawings and manufacturer's printed installation instructions.
- B. Maintain clearances required for maintenance and to protect combustible materials.
- C. Ensure proper connection to utilities.
- D. Startup each air curtain in accordance with the manufacturer's O&M manual.

- E. Test and verify proper operation of controls.
- F. Test, balance and verify scheduled capacities, velocities and temperatures are achieved.
- G. Demonstrate and instruct to the Owner's maintenance personnel how to adjust, operate and maintain each air curtain.

3.03 CLEANING

- A. Clean the outside and inside of each air curtain of any dirt, debris, grease, grime or other material as needed for a new appearance and for proper operation.
- B. Remove, clean and reinstall the re-cleanable air filters.

END OF SECTION

SECTION 23-3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single duct terminal units.

1.02 RELATED REQUIREMENTS

- A. Section 23-0500 - Common Work Results for HVAC.
- B. Section 23-0513 - Common Motor Requirements for HVAC Equipment
- C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- D. Section 23-0553 - Identification for HVAC Piping and Equipment
- E. Section 23-0593 - Testing, Adjusting, and Balancing for HVAC
- F. Section 23-0700 - HVAC Insulation
- G. Section 23 09 13 - Instrumentation and Control Devices
- H. Section 23-3113 - Sheetmetal Ductwork
- I. Section 23 33 00 - Air Duct Accessories
- J. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2012.
- B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- C. Acoustical Liner: Meet requirements of NFPA 90A, UL 181, and ASTM C665 as specified.
- D. Air Diffusion Council, ADC Standard 1062R2, Air Diffusing Equipment Test Code.
- E. Air Moving and Control Association International, AMCA Standard 210, Laboratory Methods of Testing FANs for Certified Aerodynamic Performance Rating
- F. SMACNA HVAC Duct Construction Standards; Current Edition.

1.04 SUBMITTALS

- A. Submit product data and required information in accordance with the provisions of Division 01.
- B. Product Data: Provide data indicating configuration, general assembly, materials used in fabrication, access door location and size, insulation thickness, density, and R-value. Include specific performance ratings that indicate unit ID, airflow setpoints, coil performance, air pressure drop, NC rating, and electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate support and hanging details, and service clearances required.
- D. Project Record Documents: Record actual locations of units.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.
- F. Substitutions: Refer to Division 1.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 WARRANTY

- A. See Division 01 for additional warranty requirements.
- B. Provide five year manufacturer warranty for air terminal units.

1.07 GUARANTEE

- A. Manufacturer guarantees resultant noise levels to be within NC rating published by manufacturer.

PART 2 PRODUCTS

2.01 SINGLE DUCT AIR TERMINAL UNITS

- A. Acceptable Manufacturers:

1. Anemostat, Environmental Technologies (JCI), Krueger, Metalaire, Nailor, Price, Titus, and Trane.

B. Basic Assembly:

1. Casings: Minimum 22 gauge galvanized steel.
2. Lining:
 - a. Dual Wall: Interior liner of minimum 22 gauge phosphatized steel covering the insulation. All cut edges of insulation shall be covered with metal flange. All wire penetrations shall be covered by grommets. High density, glass fiber insulation, 1" thick, 1.9 lb/cu.ft., R-Value of 4.2.
 - b. Insulation shall comply with the requirements of UL 181, NFPA 90A, and ASTM C665.
3. Provide insulated gasketed access panel on bottom of terminal unit for access to internal air valve and heating coil inspection. Adjacent duct insulation shall not block access door.
4. Leakage: Maximum 1% of maximum rated airflow at 1" wg. inlet static pressure.
5. Multi-point, multi-axis flow ring or cross sensor at box inlet.
6. Provide integral flow taps and calibration chart on each unit.
7. Factory calibrate sensor and controller for maximum, minimum, heating, and unoccupied design airflow according to the air terminal unit schedule. Terminal units scheduled for constant volume operation shall be provided with controls capable of variable volume operation.
8. Factory mount, wire, connect, calibrate, setup and test DDC controller, pressure transducer, and electronic damper actuator furnished to box manufacturer under Section 23 09 13 Instrumentation and Controls Devices. Damper actuators integral with terminal unit may be furnished by terminal unit manufacturer and operation coordinated with DDC controller.

C. Actuator / Controls: Electronic

1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud with removable cover.
2. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 1 percent of design air flow at 3 inches (0.75 kPa) rated inlet static pressure. Damper position shall be indicated on the end of the shaft on the outside of the casing

3. Controller to provide consistent air delivery within 5% of nominal airflow down to 25% of unit rated CFM, independent of changes in system static pressure.
4. The actuator shall be directly coupled to the damper shaft.

D. Electric Heating Coil:

1. Construction: UL listed, slip-in type, open coil design, integral control box factory wired and installed, with:
 - a. Disconnect type automatic thermal primary safety device.
 - b. Manual reset thermal secondary safety device.
 - c. Minimum airflow switch.
 - d. Nickel-chromium element.
 - e. Magnetic contactor for each step of control.
 - f. Include contactors as an integral part of the control panel.
2. Heater accessories:
 - a. Interlocking door handle on heater control box.
 - b. Control disconnect.
 - c. Control fuses on primary voltage hot line.
 - d. Heater fuses on all sizes.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide ceiling access doors or locate units above easily removable ceiling components.
- C. Support units independently from structure. Do not support from adjacent ductwork.
- D. Connect to ductwork in accordance with Section 23-3113.
- E. Provide insulation and engraved equipment nameplate as specified.
- F. Provide insulation in accordance with Section 23 07 00.
- G. Externally insulate coil casing including return bends with 2" thick, blanket type fiberglass insulation to prevent condensation.

- H. Verify that electric power is available and of the correct characteristics.
- I. Coordinate control installations with temperature controls vendor.

3.02 CLEANING, TESTING, STARTUP, AND DEMONSTRATION

- A. Clean and test units in accordance with Section 23-0500 - Common Work Results for HVAC.
 - 1. Include flushing of connected piping and cleaning of water control valves.
- B. Start-up units, check for proper operation as a system with air handling unit, fan, and connected ductwork.
- C. Check for clear access to control panel, isolation valves, control valves, balancing valves, and access panels. Verify required working clearance for control panels.
- D. Prepare units for Test and Balance as required by Section 23-0593 - Testing, Adjusting, and Balancing for HVAC, correct any deficiencies found and retest.
- E. Demonstrate operation of units as a complete system to maintenance personnel and instruct them in the operation, adjustment and repair of the system.
- F. Check connections to insure they are tight and without noticeable leakage. Correct any deficiencies found.

END OF SECTION

SECTION 23-3700
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.

1.02 RELATED REQUIREMENTS

- A. Section 23-0500 - Common Work Results for HVAC
- B. Section 23 33 00 - Air Duct Accessories
- C. Section 23-3113 - Sheetmetal Ductwork
- D. Section 23-3114 - Sheetmetal - Special Ductwork

1.03 SUBMITTALS

- A. Product Data: Submit product data for review in accordance with the provisions of Division 01. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- B. Samples: Submit two of each required air outlet and inlet type upon request.
- C. Project Record Documents: Record actual locations of air outlets and inlets.

1.04 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE STD 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.
- C. All louvers shall bear the AMCA Certified Ratings Program seal for Air Performance.
- D. All louvers shall bear the AMCA Certified Ratings Program seal for Air Performance, Water Penetration and Wind Driven Rain.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Anemostat, Carnes, Krueger, Metalaire, Nailor, Price, or Titus unless noted otherwise.
- B. Substitutions: Refer to Division 01.

- C. Air devices shall meet these specifications and the requirements noted in the Air Distribution Device Schedule. Titus model numbers are not inclusive of all listed requirements.
- D. Ceiling diffusers, grilles and registers shall be of steel construction when installed in a fire rated floor/ceiling or roof/ceiling assemblies as detailed in the UL Fire Resistance Index.

2.02 SUPPLY DIFFUSERS

- A. Type S1 (based on Titus TMS)
 - 1. Square, 3-cone louvered face ceiling diffuser, four way directional blow. For diffusers noted on drawings to be 2 or 3 way blow, provide blank off plates in diffuser. Provide panel, face and neck size scheduled.
 - 2. Material: Steel with baked acrylic finish.
 - 3. Color: White.
 - 4. Borders and mounting: Coordinate ceiling device frame type with architectural ceiling type. Where panel size is smaller than lay-in tile size, use surface mount frame and locate in center of tile. Maintain tile size consistent with other tiles in space.
 - 5. Dampers: Provide ceiling diffusers complete with opposed blade volume dampers where diffuser is installed in inaccessible ceiling and spin-in fitting manual volume damper at branch ductwork tap is not accessible.
 - 6. Accessories: None.

2.03 RETURN AND EXHAUST GRILLES

- A. Type R1 / E1 / TG1 (based on Titus 50F)
 - 1. Square or rectangular frame with perforated 1/2" x 1/2" x 1/2" grid. Provide frame and face size scheduled with minimum 3" deep fabricated steel backpan with centered ductwork connection equal to neck size scheduled. The visible surface of the backpan shall be painted flat black, unless noted otherwise. Provide panel, face and neck size scheduled.
 - 2. Material: Aluminum frame and grid with baked acrylic finish.
 - 3. Color: White.
 - 4. Borders and mounting: Coordinate ceiling device frame type with architectural ceiling type.

5. Dampers: Provide ceiling grille complete with opposed blade volume dampers where diffuser is installed in inaccessible ceiling and spin-in fitting manual volume damper at branch ductwork tap is not accessible.
6. Accessories: None.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install accessories in accordance with manufacturer's published recommendations as well as applicable sections of SMACNA manual and other standards set forth in Part 1.
- C. Provide all screws, bolts, nuts, inserts, and material required for attaching sheet metal to duct, walls, floors, and ceilings.
- D. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- E. Where diffusers or grilles and registers are not provided with volume dampers, install spin-in fitting with balancing damper in duct runout.

3.02 TESTING

- A. Check work for satisfactory installation and performance.
- B. Check duct connections at air inlets and outlets air leakage or condensation. Correct conditions found.

3.03 INSPECTION

- A. Air inlets and outlets shall be clean and free from scratches and dents. Repair or replace damaged devices as required.

END OF SECTION

SECTION 23-4100
PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pleated Filters
- B. Cartridge Filters
- C. Housing and Frames
- D. Filter Pressure Gauges

1.02 RELATED REQUIREMENTS

- A. Section 23-0500 - Common Work Results for HVAC.

1.03 REFERENCE STANDARDS

- A. ASHRAE 52.2; 2012: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- B. ASHRAE 52.1; 1992: Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
- C. NFPA 90A: Standard for the Installation of Air-Conditioning and Ventilating Systems.
- D. UL 586: Standard for High-Efficiency, Particulate Air Filter Units.
- E. UL 867: Electrostatic Air Cleaners
- F. UL 900: Standard for Air Filter Units.
- G. ISO 9001-2000: Certified manufacturing facility

1.04 SUBMITTALS

- A. Submit manufacturer's product data for review in accordance with the requirements of Division 01.
- B. Submit evidence of manufacturing facility certification with ISO 9001-2000.

1.05 QUALITY ASSURANCE

- A. MERV Ratings: Minimum Efficiency Reporting Value of MERV when evaluated under the guidelines of ASHRAE Standard 52.2; 2012.
- B. Average atmospheric dust spot and arrestance: Average dust spot efficiency of and a minimum arrestance based evaluation ASHRAE Standard 52.1; 1992.

- C. Performance: Media to maintain or increase in efficiency over the life of the filter.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Airguard, American Air Filter (AAF), Camfil, or Flanders/Precisionaire.

2.02 PLEATED PANEL FILTERS

- A. Scheduled as AAF Perfect Pleat HC M8 - MERV 8.
- B. Construction
 - 1. Media: Cotton and synthetic blend, lofted to a uniform depth of 0.18", and formed into a uniform radial pleats. There shall be at least 15 pleats per linear foot for 2" deep filters.
 - 2. Support: Welded wire grid, spot-welded on one-inch centers, treated for corrosion resistance, bonded to the downstream side of the media to maintain the radial pleat and prevent media oscillation.
 - 3. Frame: Minimum 28-point high wet-strength beverage board. Bond frame to media to prevent air bypass. Include integral diagonal support members on the air entering and air existing side to maintain uniform pleat spacing in varying airflow.
 - 4. Filter shall be rated by Underwriters Laboratories as UL Class 900.
- C. Performance
 - 1. The filter shall have a Minimum Efficiency Reporting Value of MERV 8 and MERV-A of 8 when evaluated under the guidelines of ASHRAE Standard 52.2-2012 must include -B with appendix J. Minimum arrestance of 92% The media shall maintain or increase in efficiency over the life of the filter.
 - 2. Initial resistance to airflow: Not to exceed 0.25" w.g. at airflow velocity of 500 feet/minute on 2" deep model.

2.03 CARTRIDGE TYPE FILTERS

- A. Scheduled as AAF Varicel RF - MERV 14.
 - 1. Construction
 - a. Media: Microfine glass laminated to a reinforcing backing to form a uniform lofted media blanket.

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- b. Blanket: Form into uniform tapered radial pleats and bonded to a stiffened backing that is bonded to the downstream side of the media to preclude media oscillation.
 - c. Bonding: Mechanically and chemically bond media within the frame to prevent air bypass.
 - d. Frame: Constructed of corrosion resistant galvanized steel. Media support contour stabilizers shall be mechanically fastened to diagonal support members of the same construction shall create a rigid and durable filter enclosure. There shall be a minimum of four contour stabilizers on the air entering side and four on the air exiting side.
 - e. Filter shall be rated by Underwriters Laboratories as UL Class 900.
2. Performance
- a. Performance: The filter media shall have an average efficiency of MERV 14 by ASHRAE 52.2-2012-B with Appendix J. It shall have an average arrestance of not less than 98%, 99 or 100 in accordance with that standard. The dust holding capacity shall not be less than 142 grams on the same standard.
 - b. Initial resistance to airflow: Not to exceed 0.53" wg at airflow velocity of 500 feet/minute.
 - c. Maximum pressure withstand rating: 10" w.g. without failure of the media pack.

2.04 HOUSINGS AND FRAMES FOR CARTRIDGE FILTERS

A. General

- 1. Filter housing: Two-stage filter system consisting of 16-gauge galvanized steel enclosure, aluminum filter mounting track, universal filter holding frame, dual-access doors, static pressure tap, filter gaskets and seals. In-line housing depth shall not exceed 21".

B. Construction

- 1. 16-gauge galvanized steel with pre-drilled standing flanges to facilitate attachment to other system components. Corner posts of Z-channel construction shall ensure dimensional adherence. The housing shall be weatherproof and suitable for rooftop/outdoor installation.
- 2. The housing shall incorporate the capability of two stages of filtration without modification to the housing. A filter track, of aluminum construction shall be an

integral component of housing construction. The track shall accommodate a 2" deep prefilter, a 12" deep rigid final filter, or a pocket filter with header.

3. Dual access doors, swing-open type: High-memory sponge neoprene gasket to facilitate a door-to-filter seal. Each door shall be equipped with adjustable and replaceable positive sealing UV-resistant star-style knobs and replaceable door hinges.
4. Universal holding frame: Constructed of 18-gauge galvanized steel, equipped with centering dimples, multiple fastener lances, and polyurethane filter sealing gasket, shall be included to facilitate installation of high-efficiency filters.
5. Fittings: Housing shall incorporate a pneumatic fitting to allow the installation of a static pressure gauge to evaluate pressure drop across a single filter or any combination of installed filters.

C. Performance

1. Leakage at rated airflow, upstream to downstream of filter, holding frame, and slide mechanism shall be less than 1% at 3.0" w.g. Leakage in to or out of the housing shall be less than one half of 1% at 3.0" w.g.
2. Accuracy of pneumatic pressure fitting, when to evaluate a single-stage, or multiple filter stages, shall be accurate within $\pm 3\%$ at 0.6" w.g.

2.05 FILTER PRESSURE GAUGES

- A. Acceptable manufacturers: Dwyer Instruments, H.O. Trerice, or Weiss Instruments.
- B. Magnehelic: Direct reading 3-1/2 inch (90 mm) diameter diaphragm actuated dial in metal case, vent valves, black figures on white background, front recalibration adjustment, +/-3% full-scale accuracy. Range shall start at zero and have a maximum of 0.25" to 1.0" w.c. above the scheduled final resistance. Mark scheduled clean and dirty resistance on face of dial. If two filter beds are installed in tandem, provide magnehelic across each filter bed.
- C. Provide filter pressure gauges as specified in addition to BAS differential pressure sensor across each filter bank.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide filters in locations as shown on drawings. Provide quantity and sizes to comply with scheduled performance.

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- B. Upon completion of ductwork and fan system, clean systems as required in Section 23-0500 - Common Work Results for HVAC and install specified filter media prior to placing system in operation.
- C. All filters shall be installed prior to operating the HVAC system. Provide a complete change in filter media as required during construction and prior to the HVAC test and balance process. If equipment and/or ductwork is found to be contaminated at any point during construction, an independent NADCA certified contractor shall be retained to clean the ductwork and/or equipment at the contractors expense.
- D. Install filters in accordance with manufacturer's published installation instructions. Provide manufacturer's recommended media change data to maintenance personnel.
- E. Install filters in frames or apparatus casing so as to be leak free. Verify with light test from both sides.
- F. Install and level filter gauges outside air stream for each bank of filters.
- G. Protect cooling and/or heating coils with temporary media during construction.
- H. Deliver one complete change of media to the maintenance personnel at Substantial Completion. Store spare media in a clean and dry place adjacent to equipment served or as coordinated with the Owner.
- I. Provide insulation as required on filter housing to prevent condensation.
- J. Insulate and make leak-proof filter access doors.

END OF SECTION

SECTION 23-7413
PACKAGED DX ROOFTOP AIR HANDLING UNIT

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Packaged DX rooftop air units
- B. Controls
- C. Roof curbs

1.02 RELATED REQUIREMENTS

- A. Section 23 05 48 - Vibration Isolation
- B. Section 23 05 00 – Common Work Results for HVAC
- C. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC
- D. Section 23 31 13 – Sheetmetal Ductwork

1.03 SUBMITTALS

- A. Submit product data for review in accordance with the provisions of Division 01.
- B. Product data shall include, but not be limited to:
 - 1. Unit dimensions and weights
 - 2. Fan curves
 - 3. Capacities
 - 4. Unit construction
 - 5. Roof curbs
 - 6. Noise criteria and sound performance
 - 7. Manufacturer’s installation instructions
 - 8. Electrical wiring diagrams and connection information
 - 9. Warranty

1.04 QUALITY ASSURANCE

- A. Unit shall have American Gas Association (AGA) design certification.
- B. Entire unit shall be UL and/or ETL Listed and certified and shall be so labeled.

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- C. Coils shall be AHRI Certified per Standard 410.
- D. Fan efficiency guide (FEG) of 67 or higher is required per AMCA 295 for applicable fans. Total fan efficiency at design point of operation shall be within 15% of the max total fan efficiency.
- E. Cooling efficiency is at standard rating conditions per AHRI 210/240 or AHRI 340/360. Performance data shall be submitted for both design and AHRI standard rating conditions.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be shipped with doors bolted shut and outside air hood closed to prevent damage during transport and thereafter while in storage prior to installation.
- B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading unit at its final location.
- C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

1.06 WARRANTY

- A. Unit and systems shall have a full parts and labor warranty as identified in Division 01 from the date of substantial completion.
- B. Other components such as compressors shall have extended warranties as noted in the following paragraphs of this section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. JCI/York
- B. Trane
- C. Daikin Applied
- D. Carrier

2.02 UNIT CONSTRUCTION

- A. Heavy gauge double wall steel panels, factory painted exterior, galvanized interior, with integral thermal break. Unit roof cap shall be cross-broken to shed water.
- B. Steel base rails, with unit lifting lugs.
- C. Insulation: 2" minimum thickness, (R-12) polyurethane foam between double wall steel panels on unit top, sides and bottom.

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- D. Double sloped stainless steel, insulated drain pan.
- E. Hinged access panels for compressor, controls, heating coils, blower and filter access, sealed with quarter turn latching handles with water-tight gasket seal.
- F. Supply and return duct connections shall be bottom or side as shown on the drawings.
- G. Where manual or automatic volume and control dampers are provided in the outside air inlet, the damper construction shall be constructed of 6010 aluminum or 304 stainless steel.
- H. Provide 18” minimum height (or as noted) roof curb to fit the unit perimeter dimensions.

2.03 UNIT COMPONENTS AND FEATURES

- A. Air cooled direct expansion cooling system, factory charged and ready for operation. Equip hermetic type compressors with positive pressure forced lubrication system, crankcase heater, and high/low pressure cut-outs.
- B. Dual spring isolated hermetic digital scroll or inverter scroll compressors. Motor compressors to be warranted against failure for five years after date of substantial completion.
- C. Cooling coils and condenser coils shall have aluminum fins mechanically bonded to copper tubes, leak tested to 350 psig minimum.
- D. Unit shall have an Air Flow Measuring Station (AFMS) in outside air inlet.
- E. Unit shall have a non-fused disconnect switch, short-circuit fuse protection, internal electrical components, required motor starters, VFDs, contactors, and overcurrent protection.
- F. Unit shall be factory wired, charged and tested, UL listed and AHRI certified.
- G. Unit features, accessories and options shall be as noted and as scheduled on drawings.
- H. Provide modulating hot gas reheat as scheduled.
- I. AMCA Low-Leakage modulating dampers.

2.04 FAN SECTION(S)

- A. Provide DWDI fan with galvanized or phosphatized painted steel scroll housing.
- B. Supply, return and exhaust fans shall be AMCA Certified and labeled, direct drive or belt driven, housed or plenum fans, VFD controlled.

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- C. Provide air foil, forward curved or backward inclined fan wheel as scheduled on drawings. Dynamically balance fan before and after installation in the cabinet section.
- D. Provide fan shaft keyed, set screwed or clamped to the wheel per the manufacturer's standard design to meet the specified performance. Maximum fan rpm to be well below the first critical speed.
- E. Provide units with resiliently mounted internal fan motor(s) on 1" deflection spring isolators. Locate motor(s) on factory slide rail base complete with adjustment nuts. Provide access to fans and internally mounted motor(s) and all bearings.
- F. Provide fan bearings of the ball, roller, or pillow block type, self-aligning and grease lubricated. Provide extended lubrication lines from fan bearing to unit casing. Connect lubrication lines to a Zerk fitting mounted on the casing. Select bearings for an average life of 200,000 hours at design operating conditions.
- G. Condenser fans shall be propeller type, direct driven with ECM motors.

2.05 GAS HEATING SECTION

- A. Induced draft, natural gas fired with direct spark ignition
- B. Electronic flame sensors
- C. High heat limit sensors
- D. Stainless steel tubular heat exchanger
- E. Redundant gas valves with manual shutoff
- F. Multi-stage or modulating heating
- G. Aluminized steel gas burners
- H. Fan and limit controls and safety switches

2.06 FILTER SECTION

- A. Provide pre-filter and final filter section with filter type, MERV rating and efficiency as scheduled on drawings.
- B. Provide a flush mount magnehelic filter gauge across each filter bank.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units in locations shown on drawings and in accordance with manufacturer's instructions.

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- B. Controls to be furnished by the unit manufacturer and factory installed, except for thermostat and remote monitoring panel furnished by the unit manufacturer and installed under the electrical division.
- C. Controls for unit shall be as shown on drawings.
- D. Fill void between bottom of unit and structural slab or deck as detailed on the drawings.
- E. Install unit on roof curb in accordance with manufacturer's instructions. Provide isolation curb and seismic tie-downs, and hurricane windstorm straps as required.

3.02 TEST AND ACCEPTANCE

- A. Start-up and checkout fan for proper motor phasing, alignment, and vibration free operation. Correct improperly aligned fans. Change unmatched belts.
- B. Test fans in accordance with Section 23 05 00 and balance in accordance with Section 23 05 93.
- C. Demonstrate system operation to Owner's maintenance personnel and instruct them in operational requirements.
- D. Verify that, where applicable, fans are interlocked with return (and exhaust) fans as required by control drawings.

END OF SECTION

SECTION 23-8239
TERMINAL HEATING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Electric Unit Heaters

1.02 RELATED REQUIREMENTS

- A. Division 26: Electrical
- B. Section 23 07 00 - HVAC Insulation
- C. Section 23 09 13 - Instrumentation and Control Devices
- D. Section 23 21 13 - HVAC Piping
- E. Section 23 21 16 - Hydronic Piping Specialties

1.03 SUBMITTALS

- A. Submit product data for review in accordance with the requirements of Division 01. Provide equipment performance data indicating compliance with and meeting the capacities scheduled on the drawings.
- B. Submit schedules of equipment and enclosures typically indicating the length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of scheduled heat required to actual heat output provided.
- C. Indicate mechanical and electrical service locations and requirements.

1.04 QUALITY ASSURANCE

- A. Provide U.L. listing and labels on all units.
- B. Provide AGA approval on gas fired units.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with a minimum of 5 years documented experience.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. As noted for each product type below.

2.02 UNIT HEATERS

- A. Acceptable Manufacturers: Airtherm, American Air, Dunham Bush, Modine, Reznor, Sterling, Trane, or Markel.
- B. Electric Unit Heaters: Size, type and capacity as indicated on drawings.
 - 1. Casing, heater element, circuit subdivision and fusing where required
 - 2. Cabinet enclosure with directional discharge louvers
 - 3. Wall mounted line voltage thermostat
 - 4. Five year heater element warranty
 - 5. Fan motor, totally enclosed, with thermal overload protection and permanently lubricated
 - 6. High temperature cut out with manual reset

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions in locations scheduled on drawings.
- B. Unit heaters shall be placed no closer than 7'-0" cylinder radius extending 7'-0" above and 2'-0" below the unit heater to any sprinkler head. High-temperature rating heads shall be used where required and as defined in NFPA 13. Coordinate placement with room layout, sprinkler head layout and fire protection contractor.
- C. Coordinate electrical connections and maintain accessibility.
- D. Provide access covers as required for access to piping, valves and controls.
- E. Align cabinet joints with window mullions.
- F. Protect unit and provide finished units with protective covers during the balance of construction.
- G. Install a minimum of 4 support wires or rods for each panel, located not more than 6" from each corner. Fasten clips to panel and to ceiling grid in accordance with the manufacturers requirements.

3.02 START-UP, TEST, DEMONSTRATION

- A. Start-up and test equipment for proper operation.
- B. Operate and test all safety devices and controls.

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- C. Demonstrate operation of equipment to maintenance personnel.
- D. Remove and replace malfunctioning units and retest.

3.03 CLEANING

- A. After construction and painting is completed, clean exposed surfaces of units.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.

END OF SECTION

SECTION 26-0500
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Basic materials and methods, along with Division 01, General Requirements, that are applicable to Division 26 sections.
- B. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 specification Sections apply to all Division 26 sections.

1.02 RELATED REQUIREMENTS

- A. Perform Work specified in Division 26 in accordance with reference standards listed below of the latest applicable edition adopted by the authority having jurisdiction. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect.

1.03 RELATED WORK SPECIFIED UNDER OTHER DIVISIONS

- A. Foundations and pads required for equipment furnished under this Division
- B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting
- C. Flashing of conduits into roofing and outside walls
- D. Heating, ventilating, and air conditioning equipment
- E. Plumbing equipment
- F. Fireproofing
- G. Automatic Doors
- H. Cutting and patching for electrical Work, except for errors and omissions under this Division.

1.04 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Submit product data, equipment details, capacities, and shop drawings as specified in sections of this Division.
- C. Submit fire alarm point-to-point drawings with product data submission.

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- D. Organize submittal material to comply with the following submittal and deviation schedules for ready recognition and uniformity. Required items re listed separately for clarity, but for each specification section , a single, comprehensive package shall be submitted for review. Individual submittals for each line item will not be accepted.
1. SD 01 - Data (Calculations and support criteria)
 2. SD 02 - Manufacturer's Catalog Data
 3. SD 03 - Manufacturer's UL or ETL listing and or rating
 4. SD 04 - Drawings (Layout and Assembly Information)
 5. SD 05 - Design Data
 6. SD 06 - Instructions (Manufacturer's and Engineer of Record)
 7. SD 07 - Schedules (Testing and Demonstration)
 8. SD 08 - Statements (Installer's and Testing Personnel and Procedures)
 9. SD 09 - Reports (Routine Testing and Inspections)
 10. SD 10 - Test Reports (NEMA, ANSI, ASTM required)
 11. SD 11 - Factory Test Reports (Owner witness and/or collaborative)
 12. SD 12 - Field Test Reports (Operating Tests and Demonstration)
 13. SD 13 - Certificates (Master UL (Lightning), Elevators, etc.)
 14. SD 14 - Samples
 15. SD 15 - TBA
 16. SD 16 - TBA
 17. SD 17 - TBA
 18. SD 18 - Records (Tests Results, etc.)
 19. SD 19 - TBA
 20. SD 20 - Training (To be provided)
- E. Submit dimensioned equipment room layouts.
1. Show location of all electrical equipment in rooms including but not limited to:
 - a. Electrical rooms and closets

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- b. Generator Room
 - c. Fire pump room
 - d. Mechanical Rooms
2. Draw room layouts to 1/4" scale, with equipment locations shown therein. Clearances shall be in accordance with NEC and local codes. Indicate on drawing the mechanical equipment and mechanical and sprinkler pipe routing.
3. Electrical equipment submittals will be rejected without dimensioned equipment room or equipment location layouts and the completed power systems study.
- F. Prepare shop drawings completely independent of the Engineer of Record's CADD files. Should the Contractor or Vendor wish to use the Engineer of Record's CADD files as the basis for developing their shop drawings, a release form, obtainable from the Engineer or Architect, must be signed and a nominal charge of \$50.00 per sheet must be made payable to the engineering firm to cover the cost of preparing the drawings for use by others.

1.05 QUALITY ASSURANCE

- A. Comply with applicable local, state, and federal codes.
- B. Warrant electrical Work against faulty material or Workmanship in accordance with Division 01. If the Project is occupied or the systems placed in operation in several phases at the request of the Owner, then the warranty of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation and accepted as such, in writing, by the Owner. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.
- C. Equipment and material provided under this Division shall be periodically inspected and serviced by competent mechanics. This function becomes the responsibility of the Owner when the system is accepted by the Owner. The one year material and Workmanship warranty is not intended to supplant normal inspection or service and shall not be construed to mean the Contractor shall provide free service for normal maintenance items such as periodic lubrication and adjustment due to normal use, nor to correct without charge, breakage, maladjustment, and other trouble caused by improper maintenance.
- D. Turn over electrical equipment provided under this Division to the Owner in lubricated condition. Include instructions on further lubrication in the operating manual.
- E. Upon completion of contract and progressively as work proceeds, clean-up and remove dirt, debris and scrap materials. Maintain premises neat and clean. Protect and preserve access to energized equipment at all times. Clean items with factory finishes.

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Touch-up minor damage to surfaces; refinish entire piece of equipment when sustained major damage. Use only factory supplied paints of matching color and formula. Schedule an off-hour shutdown of all electrical equipment during the 2-week period preceding substantial completion. During this shut down, clean all buses and insulators inside all switchgear, switchboards, bus ducts, collector buses and panelboards located inside or adjacent to the project limits.

1.06 COMMISSIONING

- A. An independent third-party Commissioning Agent will document completion of the Electrical Systems. The Contractor is a member of the Commissioning Team and will facilitate completion of the Commissioning process. Refer to section 019113 General Commissioning Requirements for the project Commissioning requirements and roles and responsibilities of each member of the Commissioning Team.

1.07 OPERATING AND MAINTENANCE MANUALS

- A. Provide manuals in accordance with Division 01.
- B. In addition to required submittals, include copies of all test reports required in Part 3, "Execution" of Section 26-0500 - Common Work Results For Electrical.
- C. Provide completed warranty certificates for systems and equipment.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where this is not practical, cover items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.
- B. Store items in a clean dry place and protect from damage. Evidence of damage from water or other contaminants will be cause for rejection.

1.09 PRODUCT PROCUREMENT AND SUBSTITUTION

- A. Comply with the provisions of Division 01.

1.10 FEES AND PERMITS

- A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

1.11 RECORD DRAWINGS

- A. Comply with provisions of Division 01.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Equipment and materials furnished shall be listed by UL or other nationally accredited testing laboratory where available. When listing is not available for a piece of equipment, it shall be submitted in accordance with Drawings and Specifications and shall be approved by the authorities having jurisdiction.
- B. Specifications and Drawings indicate name, type and/or catalog number of materials and equipment to establish standards of quality. Submittals shall be based on the standards specified. The standards should not be construed as limiting competition.
- C. If materials and equipment other than specified herein are intended to be submitted, a letter providing a list of all the suggested alternates by section number, brand and series or model shall be submitted to the Architect for review and approval. Submit in accordance with Division 01 and a minimum of 14 days prior to submission of bids.

2.02 FUSES

- A. Provide fuses as scheduled on Drawings for switchboards, power panelboards and disconnecting switches.
- B. Acceptable manufacturers: Bussmann; Gould Shawmut; Littelfuse, Inc
- C. Provide fuses of one manufacturer only. Place the same type fuse in each pole of a switch.
- D. Use these types:
 - 1. Class L-601A-6000A; Switchboards, all load types
 - 2. Class J-Time Delay-1A-600A; Switchboards, motor loads
 - 3. Class J-Fast Acting-1A-600A; Switchboards, other loads
 - 4. Class RK5-Time Delay-1/10A-600A; Power panels and fusible switches, motor loads
 - 5. Class RK1-Fast Acting-1A-600A; Power panels and fusible switches, other loads

2.03 WALL AND CEILING ACCESS PANELS

- A. Style and type as required for material in which installed.
 - 1. Size: 16" X 16" minimum, as indicated, or as required to allow inspection, service and removal of items served

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2. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction
3. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas
4. Prime painted or rust inhibitive paint finish
5. UL labeled when in fire-rated construction, 1 1/2 hour rating
6. Provide in walls, floors, and ceilings to permit access to all equipment and junction boxes.
7. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.
8. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers. 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

PART 3 - EXECUTION

3.01 COORDINATION

- A. Install equipment in accordance with manufacturer's recommendations. Where conflicts occur between Contract Documents and these recommendations, request a ruling before proceeding with such Work.
- B. Visit site and observe conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work required by these documents.
- C. Examine Specifications and Drawings to be familiar with items which require electrical connections and coordination. Electrical Drawings are diagrammatic and shall not be scaled for exact sizes.

3.02 TEMPORARY LIGHTS AND POWER

- A. Comply with provisions of Division 01.
- B. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary Work shall be installed in a neat and safe manner in accordance with the National Electrical Code, Article 305, NFPA 241, and as required by OSHA or applicable local safety codes.

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- C. Provide one pigtail socket with 150 watt lamp, CFL medium base, for every 1,000 square feet of floor area, evenly distributed throughout the building and with minimum of one pigtail socket per room.
- D. Provide suitable guards for temporary lights to prevent accidental contact with lamps.
- E. Provide a minimum of one GFCI-protected duplex power outlet for every 1,500 square feet of floor area, evenly distributed throughout the building. Power outlets shall be GFCI-protected duplex 20 amp, 120 volt.
- F. Provide feeders, disconnects, connections, etc., required for construction equipment, eg: cranes, pumps, etc.
- G. Prior to installation, determine if any lighting or power outlets over the minimum quantity noted above are required and if so, provide them.
- H. Provide service and panelboards required for above lighting and power outlets.
- I. Requirements for payment of utility bills during construction are specified in Division 01.
- J. Provide single phase and three phase service as required by Project.
- K. Remove temporary wiring upon completion of use.
- L. Furnish and install temporary heat detectors and pull stations in the construction area. Provide detectors, manual stations, wire, conduit, installation, programming and demolition of same after permanent system is installed. Protect construction area at all unoccupied times utilizing the hospital's fire alarm system. Turn over temporary heat detector to the Owner after they have been removed.

3.03 CUTTING AND PATCHING

- A. Comply with provisions of Division 01
- B. Repair or replace routine damage caused by cutting in performance of Work under this Division.
- C. Correct unnecessary damage caused due to installation of electrical Work, brought about through carelessness or lack of coordination.
- D. Holes cut through floor slabs shall be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs between floors shall be properly sealed, fire proofed and water proofed.
- E. Holes cut through walls shall be drilled or cut with tools designed for the purpose. All openings, sleeves and holes in walls that extend to underside of floor above shall be properly sealed and fire proofed.

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- F. Repairs shall be performed with materials which match existing materials and be installed in accordance with appropriate sections of these Specifications.
- G. Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

3.04 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

- A. Comply with provisions of Division 31.
- B. Provide trenching, excavation, and backfilling necessary for performance of Work under this Division.
- C. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition for Work to be performed.
- D. Trenching and excavation shall be unclassified. No extra will be paid in event that rock is encountered.

3.05 FOUNDATIONS AND PADS

- A. Provide concrete foundations and pads for equipment per the requirements Division 03. Locate and size foundations, pads, and anchor bolts as required for equipment in this Division.
- B. Provide concrete foundations and pads as required for electrical utility company's equipment such as transformers, CT cabinets, metering cabinets, switches, fused disconnects, and circuit breakers. All work shall be in compliance with the utility company's specifications.

3.06 CONTROL SYSTEMS AND INTERLOCK WIRING

- A. Control systems, components and control and interlock wiring for mechanical equipment will be furnished under Divisions 21, 22 and 23. Control devices including, but not limited to, thermostats, fan speed and level control switches, relays and electro-pneumatic switches shall be furnished under Divisions 22 and 23.
- B. Provide manual motor starters per Section 26-2913 - Enclosed Controllers.
- C. Provide variable frequency motor controllers per Section 26-2923.
- D. Provide power wiring to starters, variable frequency motor controllers, and contactors under Division 26. Power wiring to magnetic starters and variable frequency motor controllers shall consist of wiring to the line side terminals of the magnetic starter or contactor or variable frequency motor controller and wiring away from the load side terminals to the equipment, except where such wiring is installed pre-wired by the equipment vendor. Where external filters are required for harmonic control, wiring to/from this equipment shall be included.

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1. Power wiring to 120V, 1-phase, 60 Hz and 277V, 1-phase, 60 Hz volt fans, unit heaters, fan-coil units, VAV boxes, pumps and other equipment shall include all portions of the branch circuit, except for wiring inside an automatic temperature control panel (ATC) or Direct Digital Control Panel (DDC), Building Automation System panels, equipment control panels, variable frequency motor controllers, or magnetic starters. Such internal wiring shall be furnished under Divisions 21, 22 and 23.
- E. Under Division 28:
1. Furnish duct mounted smoke detectors.
 2. Provide wiring among detectors, fire alarm system, magnetic starters, variable frequency motor controllers, and relays, ATC panels and DDC panels
- F. See Building Automation System sections of Division 23.

3.07 UTILITY COMPANY COORDINATION

- A. Coordinate with the serving utility company as to all types of work required to be done by the contractor for utility equipment.
- B. Confirm exact location of point of common coupling, duct banks, pads, etc.
- C. Obtain copies of all pertinent utility company specifications relating to duct banks, concrete pads, raceways, and cable that are contractor installed for the utility company use. Maintain copies at project site.
- D. Install at components in compliance with utility company specifications and project specifications.

3.08 TESTING ELECTRICAL SYSTEMS

- A. On completion of work, installation shall be completely operational and entirely free from grounds, short circuits, and open circuits. Perform operational tests as required to demonstrate substantial completion of the Work. Balance circuits so that feeders to panels are not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests. All ampere readings shall be made with a true RMS reading meter.
- B. Perform megger tests of all service entrance circuits, feeder and branch circuits size #4 AWG and larger. Provide a report of all such megger test results.
- C. Furnish the Architect a copy of test reports and required certification including but not limited to the following:
 1. Service ground resistance test

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2. Switchboard and panelboard load test - include ampere readings of all panels and major circuit breakers
 3. Generator full load per NFPA 110 and complete operational test
 4. Ground Fault Test
 5. Fire Alarm System Certification
 6. Power System Analysis Report
- D. Prior to final observation and acceptance test, install all electrical systems and equipment complete and in satisfactory operating condition.

END OF SECTION

SECTION 26-0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Heat shrink tubing.
- E. Oxide inhibiting compound.
- F. Wire pulling lubricant.
- G. Cable ties.
- H. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 07-8400 - Firestopping.
- B. Section 26-0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 26-0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26-0536 - Cable Trays for Electrical Systems: Additional installation requirements for cables installed in cable tray systems.
- E. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

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- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Most Recent Edition, Including All Revisions.
- N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- R. UL 2196 - Fire Test for Circuit Integrity of Fire Resistive Power, Instrumentation, Control and Data Cables

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

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2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- D. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.
- E. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.
- F. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
- G. Field Quality Control Test Reports.
- H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- I. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01-6000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

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- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Underground feeder and branch-circuit cable is not permitted.
- D. Service entrance cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.

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- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 26-0526.
- I. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Acceptable Manufacturers:

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1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. Service Wire Co: www.servicewire.com/#sle.
 - d. Southwire Company: www.southwire.com/#sle.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 1. Copper Building Wire: Type THHN/THWN, except as indicated below.
 - a. Size 4 AWG and Larger: Type THHN/THWN-2.
 - b. Installed Underground: Type XHHW-2.

2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26-0526.
- C. Wiring Connectors for Splices and Taps:
 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
 3. Connectors for Aluminum Conductors: Use compression connectors.
- D. Wiring Connectors for Terminations:

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1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 6. Aluminum Conductors: Use compression connectors for all connections.
 7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 8. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.05 ACCESSORIES

- A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm);

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resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
 5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- D. Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 3. Suitable for use at installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

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1. Products:
 - a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
 - b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
- H. Sealing Systems for conductors in ducts entering/exiting from exterior locations: Sealant system for prevention of moisture, gases and rodents from entering building and/or gear via raceways, designed to be used after cable installation.
 1. Must be compatible with wide range of cable jacket materials
 2. Designed for used with PVC, GRS, EMT, IMC, fiberglass or PR conduit materials
 3. Capable of holding up to 22 feet of water head pressure
 4. Products:
 - a. Polywater; FST Foam Duct Sealant kit (2" conduits and larger)
 - b. Polywater; FST Foam Duct Sealant MINI (1.5" conduits and smaller)
 - c. Approved equal

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:

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1. Unless dimensioned, circuit routing indicated is diagrammatic.
 2. When circuit destination is indicated without specific routing, determine exact routing required.
 3. Arrange circuiting to minimize splices.
 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is permitted, under the following conditions:
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
 - b. Increase size of conductors as required to account for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
 9. Provide oversized neutral/grounded conductors where indicated and as specified below.
 - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
 - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

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2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.
 2. Protect cables from physical damage.
- F. Installation in Cable Tray: Also comply with Section 26-0536.
- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- I. Terminate cables using suitable fittings.
1. Armored Cable (Type AC):
 - a. Use listed fittings and anti-short, insulating bushings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
 - c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
 2. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.

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- b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
 - c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
- J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.
- L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- N. Make wiring connections using specified wiring connectors.
- 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 - 5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
 - 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

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- a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
- a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.
- P. Insulate ends of spare conductors using vinyl insulating electrical tape.
- Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- R. Identify conductors and cables in accordance with Section 26-0553.
- S. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07-8400.
- T. Install sealant within conduits entering/exiting from exterior or underground to prevent intrusion of moisture, gasses and rodents to building and/or gear.
- U. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is only required for conductors larger than No. 4 AWG. The resistance test for parallel conductors listed as optional is required.

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1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26-0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Ground access wells.

1.02 RELATED REQUIREMENTS

- A. Section 26-0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

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1. Verify exact locations of underground metal water service pipe entrances to building.
 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements for submittals procedures.
- B. Submit all items, except field quality related in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Field quality control test reports.
- D. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Metal In-Ground Support Structure:

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- a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 5. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
 6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- F. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system, sized in accordance with NEC Table 250.66. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed, sized in accordance with NEC Table 250.102 or at 12.5% of the area of the largest ungrounded supply conductor or equivalent area for parallel supply conductors where ungrounded supply conductors are larger than 1100 kcmil copper or 1750 kcmil aluminum. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- G. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

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3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
- H. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26-0526:
1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.

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- 2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
- D. Make grounding and bonding connections using specified connectors.

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1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 26-0553.

3.02 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 26-0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 03-3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05-5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 26-0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- D. Section 26-0536 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.
- E. Section 26-0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- F. Section 26-2513 - Low-Voltage Busways: Additional support and attachment requirements for busway.
- G. Section 26-5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- H. Section 26-5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

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- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03-3000.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements for submittal procedures.
- B. Submit all items in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.
- D. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- E. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- F. Installer's Qualification Statement: Include evidence of compliance with specified requirements.

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- G. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- D. Installer Qualifications for Field-Welding: As specified in Section 05-5000.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - 2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 3. Provide products listed, classified, and labeled by Underwriters Laboratories (UL) as suitable for the purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.

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6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Comply with MFMA-4.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
 - d. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
 - e. Outlet Boxes: 1/4 inch (6 mm) diameter.
 - f. Luminaires: 1/4 inch (6 mm) diameter.
- F. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.

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5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, low voltage cable tray systems, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

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- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Field-Welding (where approved by Architect): Comply with Section 05-5000.
- I. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03-3000.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- J. Conduit Support and Attachment: Also comply with Section 26-0533.13.
- K. Cable Tray Support and Attachment: Also comply with Section 26-0536.
- L. Box Support and Attachment: Also comply with Section 26-0533.16.
- M. Busway Support and Attachment: Also comply with Section 26-2513.
- N. Interior Luminaire Support and Attachment: Also comply with Section 26-5100.
- O. Exterior Luminaire Support and Attachment: Also comply with Section 26-5600.
- P. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- Q. Secure fasteners according to manufacturer's recommended torque settings.
- R. Remove temporary supports.
- S. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.

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- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26-0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. PVC-coated galvanized steel rigid metal conduit (RMC).
- D. Flexible metal conduit (FMC).
- E. Liquidtight flexible metal conduit (LFMC).
- F. Electrical metallic tubing (EMT).
- G. Rigid polyvinyl chloride (PVC) conduit.
- H. Conduit fittings.

1.02 RELATED REQUIREMENTS

- A. Section 07-8400 - Firestopping.
- B. Section 26-0526 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- C. Section 26-0529 - Hangers and Supports for Electrical Systems.
- D. Section 26-2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
- E. Section 31-2316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2018.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- E. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.

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- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- L. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- M. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- N. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements for submittals procedures.
- B. Submit all items in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- D. Shop Drawings:
 - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 - 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- E. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

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C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.

D. Embedded Within Concrete:

1. Within Slab on Grade: Not permitted.
2. Within Slab Above Ground: Not permitted.
3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.

E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

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- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
 - 1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
- J. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- K. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet (1.8 m).
- L. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Motors.

2.02 CONDUIT REQUIREMENTS

- A. Electrical Service Conduits: Also comply with Section 26-2100.
- B. Communications Systems Conduits: Also comply with Section 27-1000.
- C. Fittings for Grounding and Bonding: Also comply with Section 26-0526.
- D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- E. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Underground, Interior: 3/4 inch (21 mm) trade size.

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4. Underground, Exterior: 1 inch (27 mm) trade size.
- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
- C. PVC-Coated Fittings:
 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.

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3. Material: Use steel or malleable iron.
 4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.06 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.

2.07 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.

2.08 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:

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- a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route conduits exposed:
- a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
- a. Heaters.
 - b. Hot water piping.
 - c. Flues.
14. Group parallel conduits in the same area together on a common rack.
- I. Conduit Support:

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1. Secure and support conduits in accordance with NFPA 70 and Section 26-0529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
 9. Use of spring steel conduit clips for support of conduits is not permitted.
 - a. Support of electrical metallic tubing (EMT) up to 1 inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
 10. Use of wire for support of conduits is not permitted.
 - a. For securing conduits to studs in hollow stud walls.
 - b. For suspending conduits supported by spring steel conduit clips (only where specifically indicated or permitted).
 11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

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3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

K. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade. All bolts, nuts and fasteners shall be steel with 2-part Dichromate corrosion inhibiting coating or Type 316 Stainless steel.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
9. Provide metal escutcheon plates for conduit penetrations exposed to public view.

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10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07-8400.
- L. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31-2316.13.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches (610 mm).
 - b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
 3. Provide underground warning tape in accordance with Section 26-0553 along entire conduit length for service entrance where not concrete-encased.
- M. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Include proposed conduit arrangement with submittals.
 2. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
 3. Minimum Conduit Spacing: _____.
 4. Install conduits within middle one third of slab thickness.
 5. Secure conduits to prevent floating or movement during pouring of concrete.
- N. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03-3000 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.
- O. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- P. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

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3. Where conduits are subject to earth movement by settlement or frost.
- Q. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 3. Where conduits penetrate coolers or freezers.
- R. Install sealant within conduits entering/exiting from exterior or underground to prevent intrusion of moisture, gasses and rodents to building and/or gear.
- S. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- T. Provide grounding and bonding in accordance with Section 26-0526.
- U. Identify conduits in accordance with Section 26-0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26-0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

1.02 RELATED REQUIREMENTS

- A. Section 03-3000 - Cast-in-Place Concrete.
- B. Section 07-8400 - Firestopping.
- C. Section 08-3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- D. Section 26-0526 - Grounding and Bonding for Electrical Systems.
- E. Section 26-0529 - Hangers and Supports for Electrical Systems.
- F. Section 26-0533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- G. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 26-2726 - Wiring Devices:
 - 1. Wall plates.
 - 2. Additional requirements for locating boxes for wiring devices.
- I. Section 27-1000 - Structured Cabling System: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

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- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.

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7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for junction and pull boxes and cabinets and enclosures.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, and cabinets and enclosures.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01-6000 - Product Requirements, for additional provisions.
 2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:

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1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
 4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
 5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
 6. Use suitable concrete type boxes where flush-mounted in concrete.
 7. Use suitable masonry type boxes where flush-mounted in masonry walls.
 8. Use raised covers suitable for the type of wall construction and device configuration where required.
 9. Use shallow boxes where required by the type of wall construction.
 10. Do not use "through-wall" boxes designed for access from both sides of wall.
 11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

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13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
14. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
15. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
16. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
 - b. Communications Systems Outlets: Comply with Section 27-1000.
 - c. Ceiling Outlets: 4 inch octagonal or square by 2-1/8 inch deep (100 by 54 mm) trade size.
17. Wall Plates: Comply with Section 26-2726.
18. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
 - c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - e. Thomas & Betts Corporation: www.tnb.com/#sle.
 - f. Substitutions: See Section 01-6000 - Product Requirements.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

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- a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 - b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
- a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
- a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
 - c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.
 - d. Substitutions: See Section 01-6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

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- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08-3100 as required where approved by the Architect.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26-2726.
 - b. Communications Systems Outlets: Comply with Section 27-1000.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 - 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
 - 9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

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- b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26-0533.13.
11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- I. Box Supports:
 1. Secure and support boxes in accordance with NFPA 70 and Section 26-0529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

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3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- L. Floor-Mounted Cabinets: Mount on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03-3000.
- M. Install boxes as required to preserve insulation integrity.
- N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- O. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.
- P. Underground Boxes/Enclosures:
 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
 2. Flush-mount enclosures located in concrete or paved areas.
 3. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
 4. Provide cast-in-place concrete collar constructed in accordance with Section 03-3000, minimum 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep), around enclosures that are not located in concrete areas.
 5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- Q. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07-8400.
- S. Close unused box openings.
- T. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- U. Provide grounding and bonding in accordance with Section 26-0526.
- V. Identify boxes in accordance with Section 26-0553.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

BOXES FOR ELECTRICAL SYSTEMS 26-0533.16 -10

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3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26-0543
ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ductbank construction and pricing
- B. Precast concrete manholes.
- C. Accessories:
 - 1. Underground warning tape.

1.02 RELATED REQUIREMENTS

- A. Section 03-3000 - Cast-in-Place Concrete.
- B. Section 07-1113 - Bituminous Dampproofing.
- C. Section 22-1006 - (DO NOT USE) Plumbing Piping Specialties.
- D. Section 31-2323 - Fill: Bedding and backfilling.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 01-2200 - Unit Prices, for additional unit price requirements.
- B. Ductbank:
 - 1. Basis of Measurement: By the lineal foot (meter), for each configuration.
 - 2. Basis of Payment: Includes purchase, delivery, and installation of duct, fittings, supports, and accessories, and for trenching, concrete encasement, and backfill.

1.04 REFERENCE STANDARDS

- A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.
- B. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures; 2019.
- C. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures; 2019.
- D. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures; 2020.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles (160 km) of Project.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 CONDUIT AND DUCT

- A. See section 260533.13 - Conduit for Electrical Systems.

2.02 HANDHOLES

- A. See section 260533.16 - Boxes for Electrical Systems.

2.03 PRECAST CONCRETE MANHOLES

- A. Description: Precast manhole designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.
- B. Loading: ASTM C857, Class A-16.
- C. Shape: Square.
- D. Base Section: Include 3 inch (75 mm) deep x 14 inch (350 mm) round sump with cast sleeve, and two 1 inch (25 mm) ground rod openings.
- E. Top Section: Include 39 inch (1000 mm) diameter grooved opening for frame and cover.
- F. Riser Casting: 6 inch (150 mm), with manhole step cast into frame.
- G. Frames and Covers: ASTM A48/A48M; Class 30B gray cast iron, 27 inch (686 mm) size, machine finished with flat bearing surfaces. Provide cover marked ELECTRIC to indicate utility.
- H. Duct Entry Provisions: Single duct knockouts.
- I. Duct Entry Size: 4 inch (100 mm).
- J. Cable Pulling Irons: Use galvanized rod and hardware. Locate opposite each duct entry. Provide watertight seal.

ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES 26-0543 -3

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- K. Cable Racks: Steel channel, 1-1/2 x 3/4 x 14 inches (38 x 19 x 350 mm), with fastener to match mounting channel.
- L. Cable Supports: Porcelain clamps and saddles.
- M. Manhole Steps: Polypropylene plastic manhole step with 1/2-inch steel reinforcement (Polypropylene plastic manhole step with 13 mm steel reinforcement).
- N. Sump Covers: ASTM A48/A48M; Class 30B gray cast iron.

2.04 ACCESSORIES

- A. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.
 - 1. Products:
 - a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.
- B. Underground Warning Tape: Polyethylene tape suitable for direct burial.
 - 1. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
 - 2. Legend: Type of service, continuously repeated over full length of tape.
 - 3. Color:
 - a. Tape for Buried Power Lines: Black text on red background.
 - b. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 SOURCE QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify routing and termination locations of duct bank prior to excavation for rough-in.
- C. Verify locations of manholes prior to excavating for installation.

ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES 26-0543 -4

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- D. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.
- E. Manhole locations are shown in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system.

3.02 DUCT BANK INSTALLATION

- A. Install duct to locate top of ductbank at depths as indicated on drawings.
- B. Install duct with minimum slope of 4 inches per 100 feet (100 mm per 25.4 m) (0.33 percent). Slope duct away from building entrances.
- C. Cut duct square using saw or pipe cutter; de-burr cut ends.
- D. Insert duct to shoulder of fittings; fasten securely.
- E. Join nonmetallic duct using adhesive as recommended by manufacturer.
- F. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- G. Install no more than equivalent of three 90-degree bends between pull points.
- H. Provide suitable fittings to accommodate expansion and deflection where required.
- I. Terminate duct at manhole entries using end bell.
- J. Stagger duct joints vertically in concrete encasement 6 inches (150 mm) minimum.
- K. Use suitable separators and chairs installed not greater than 4 feet (1200 mm) on centers.
- L. Band ducts together before backfilling.
- M. Securely anchor duct to prevent movement during concrete placement.
- N. Place concrete under provisions of Section 03-3000. Use mineral pigment to color concrete red.
- O. Provide minimum 3 inch (75 mm) concrete cover at bottom, top, and sides of ductbank.
- P. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.
- Q. Provide suitable pull string in each empty duct except sleeves and nipples.
- R. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES 26-0543 -5

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- S. Interface installation of underground warning tape with backfilling. Install tape ____ inches (____ mm) below finished surface.

3.03 PRE-CAST MANHOLE INSTALLATION

- A. Install and seal precast sections in accordance with ASTM C891.
- B. Install manholes plumb.
- C. Use precast neck and shaft sections to bring manhole cover to finished elevation.
- D. Attach cable racks to inserts after manhole installation is complete.
- E. Install drains in manholes and connect to site drainage system under provisions of Section 22-1006.
- F. Install drains in manholes and connect to 4 inch (DN100) pipe terminating in 1/3 cu yd (1/4 cu m) crushed gravel bed under provisions of Section 22-1006.
- G. Dampproof exterior surfaces, joints, and interruptions of manholes after concrete has cured 28 days, under provisions of Section 07-1113.
- H. Backfill manhole excavation under the provisions of Section 31-2323.

END OF SECTION

SECTION 26-0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Underground warning tape.
- E. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 26-0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 26-2726 - Wiring Devices: Device and wall plate finishes; factory pre-marked wall plates.
- C. Section 27-1000 - Structured Cabling System: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 70E - Standard for Electrical Safety in the Workplace; 2021.
- C. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

IDENTIFICATION FOR ELECTRICAL SYSTEMS 26-0553 -2
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2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements for submittals procedures.
- B. Submit all items in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- D. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- E. Samples:
 1. Identification Nameplates: One of each type and color specified.
 2. Warning Signs and Labels: One of each type and legend specified.
- F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identify electrical equipment with permanently attached phenolic plates with 1/4" white or black engraved lettering on the face of each, attached with two sheet metal screws. Provide nameplate colors as specified in other parts of this section.
- B. Include the following information on panelboard identification plates:
 1. Panel Name
 2. Name of panel serving it
 3. Voltage and Phase

IDENTIFICATION FOR ELECTRICAL SYSTEMS 26-0553 -3
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C. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number where power originates. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
 - b. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number where power originates. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
 - c. Enclosed switches, circuit breakers, and motor controllers (including variable frequency motor controllers):
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number where power originates. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
2. Service Equipment:

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- a. Use identification nameplate to identify each service disconnecting means.
 3. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
 4. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
 5. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
 6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 7. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
- D. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26-0519.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.

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- c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 - 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
- E. Identification for Devices:
- 1. Wiring Device and Wall plate Finishes: Comply with Section 26-2726.
 - 2. Factory Pre-Marked Wall plates: Comply with Section 26-2726.
 - 3. Use identification label to identify fire alarm system devices.
 - 4. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
- F. Identification for Luminaires:

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
- 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
 - 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 - 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 - 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:

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1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:
 1. Tape for Buried Power Lines: Black text on red background.
 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:

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1. Materials:
 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.

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- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
 - 1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26-0573
POWER SYSTEM ANALYSIS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or a professional electrical engineering firm.
- B. The studies shall include all new electrical distribution equipment supplied under this contract.
 - 1. Include emergency power system distribution equipment.
 - 2. Include all directly affected existing distribution equipment including emergency equipment at the customer facility.
 - 3. Include all existing distribution equipment including emergency equipment at the customer facility.
- C. If equipment from the specific manufacturer the project is designed around is submitted, a power study performed in accordance with this section and prepared by the equipment manufacturer shall be submitted.

1.02 RELATED REQUIREMENTS

- A. Section 26-0500 - Common Work Results For Electrical
- B. Section 26-1319 - Medium Voltage Vacuum Interrupter Switchgear
- C. Section 26-1320 - Paralleling Switchgear, Medium Voltage
- D. Section 26-2300 - Low Voltage Switchgear
- E. Section 26-2313 - Paralleling Low Voltage Switchgear
- F. Section 26-2413 - Switchboards
- G. Section 26-2416 - Panelboards

1.03 REFERENCE STANDARDS

- A. IEEE 241 - IEEE Recommended Practice for Electric Power Systems in Commercial Buildings; 1990 (R1997).
- B. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

- C. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.
- D. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 70E - Standard for Electrical Safety in the Workplace; 2021.

1.04 SUBMITTALS

A. Submittals for Review/Approval

1. Submit a preliminary short-circuit and protective device coordination study to the design engineer prior to receiving final approval of the shop drawings and/or prior to release of equipment drawings for manufacturing. The preliminary study shall provide sufficient data to ensure that the selection of equipment will have adequate ratings and the protective device trip characteristics will be satisfactory.
2. Submit the final short-circuit and protective device coordination analysis at the end of the construction cycle when circuits are installed and all equipment is on site and/or installed such that complete and accurate data may be obtained.

B. Submittals for Construction

1. The results of the final short-circuit and protective device coordination analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies of the short-circuit input and output data, where required, shall be provided on CD in PDF format.
2. At the owner's option, the contractor is required to provide the study project files to the Owner in electronic format including all project files, libraries, etc to allow the owner to update and to print additional copies, labels, etc.
3. If the owner does not use the applicable computer program, a copy of the computer analysis software viewer program is required to accompany the electronic project files, to allow the Owner to review all aspects of the project and print arc flash labels, one line diagrams, etc.
4. The report shall include the following sections:
 - a. Executive Summary.

- b. Descriptions, purpose, basis and scope of the study.
 - c. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short circuit duties.
 - d. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip unit settings, and fuse selection.
 - e. Fault current calculations including a definition of terms and guide for interpretation of the computer printout.
 - f. Recommendations for system improvements, where needed.
 - g. Impedance one line diagram.
 - h. ANSI Fault study one line with branch fault current flow.
5. If the power systems study submittal is not approved following the second submittal, the contractor shall pay the Project Engineer \$200.00 per hour to review additional submittals until the study is approved.

1.05 QUALIFICATIONS

- A. The short-circuit and protective device coordination analysis studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.
- B. The Registered Professional Electrical Engineer shall be a full-time employee of the electrical equipment manufacturer or a professional electrical engineering firm.
- C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

1.06 COMPUTER ANALYSIS SOFTWARE

- A. The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) software program. Other commercially available products may be considered under certain circumstances.

PART 2 - PRODUCT

2.01 STUDIES

- A. Furnish short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or a professional electrical engineering firm.

2.02 DATA COLLECTION

- A. Electrical Contractor shall furnish all data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination, and arc flash hazard analysis studies (if required) shall furnish the Electrical Contractor with a list of required data immediately after award of the contract. The Electrical Contractor shall expedite collection of the data to ensure completion of the studies as required.
- B. The engineer performing the study shall make at least one job site visit before completion of the final study to familiarize himself/herself with the project to ensure that the provided data is accurate.
- C. Source contribution shall include present and future motors and generators.
- D. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT STUDY

- A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141.
- B. Estimated conductor lengths, typical generator, transformer, motor, and utility data may be used for the preliminary study.
- C. Actual installed conductor lengths, test and/or nameplate data for all generators, transformers, motors 50 HP and larger, capacitors, reactors, or other equipment that may affect the study must be used for the final study.
- D. Actual utility fault current and X/R ratio shall be used. Infinite bus calculation is not acceptable.
- E. The pre-fault bus voltage shall be the highest reported by the utility for past 5 years. If unavailable, 1.05 per unit shall be used.
- F. Provide the following:
 - 1. Calculation methods and assumptions.
 - 2. Selected base per unit quantities.
 - 3. One line diagram of the system being evaluated.
 - 4. Utility impedance data, including the maximum and minimum 3 phase and line-to-ground fault current available, nominal, maximum, and minimum voltage, 3 phase X/R ratio, and line-to-ground X/R ratio.
 - 5. Utility protective device settings including recloser if used.

6. Motor fault contribution characteristics.
 7. Generator fault contribution characteristics.
 8. Tabulations of calculated quantities.
 9. Results, conclusions, and recommendations.
- G. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
1. Electric utility's supply termination point
 2. Incoming switchgear
 3. Unit substation primary and secondary terminals
 4. Low voltage switchgear.
 5. Motor control centers.
 6. Standby generators and automatic transfer switches.
 7. Branch circuit panelboards.
 8. Other significant locations throughout the system.
- H. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.
- I. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings.
 2. Adequacy of switchgear, switchboards, disconnects, transfer switches, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
 3. Notify Owner, in writing, of any existing circuit protective devices improperly rated for the calculated available fault current.

2.04 PROTECTIVE DEVICE COORDINATION STUDY

- A. Proposed protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs. No more than 5 devices shall be shown on any plot.
- B. Include on each TCC graph, a complete title, applicable notes, and one-line diagram with legend identifying the specific portion of the system covered.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

- D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the TCC graphs, where applicable:
 - 1. Electric utility's overcurrent protective device.
 - 2. Medium voltage equipment overcurrent relays.
 - 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
 - 5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves. The frequent fault portion of the damage curve should not be shown unless the transformer feeds overhead lines. The shifted curve for line-to-ground faults on the secondary side shall be shown on the ground fault plot.
 - 6. Conductor damage curves.
 - 7. Ground fault protective devices shall be shown on separate TCC plots. The first phase overcurrent relay and any negative sequence relays on the primary side of a delta-wye transformer shall be shown.
 - 8. Pertinent motor starting characteristics, motor damage points, and overload relay. Motors larger than 500 HP shall have a thermal damage curve.
 - 9. Pertinent generator short-circuit decrement curve and generator damage point. Generators larger than 1250 kW shall have a thermal damage curve.
 - 10. The largest feeder circuit breaker in each motor control center and applicable panelboard.
- F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.05 REPORT SECTIONS

- A. Input data shall include, but not be limited to the following:
 - 1. Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum).
 - 2. Transformer input data, including winding connections, secondary neutral-ground connection, primary and secondary voltage ratings, KVA rating, impedance, % taps and phase shift.

3. Reactor data, including voltage rating, and impedance.
 4. Generation contribution data, (synchronous generators and Utility), including short-circuit reactance (X''_d), rated MVA, rated voltage, three-phase and single line-ground contribution (for Utility sources) and X/R ratio.
 5. Motor contribution data (induction motors and synchronous motors), including short circuit reactance, rated horsepower or KVA, rated voltage, and X/R ratio.
- B. Short-Circuit Output Data shall include, but not be limited to the following reports:
1. Low Voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
 - a. Voltage
 - b. Calculated fault current magnitude and angle
 - c. Fault point X/R ratio
 - d. Equivalent impedance
 2. Momentary Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
 - a. Voltage
 - b. Calculated symmetrical fault current magnitude and angle
 - c. Fault point X/R ratio
 - d. Calculated asymmetrical fault currents
 3. Based on fault point X/R ratio
 4. Based on calculated symmetrical value multiplied by 1.6
 5. Based on calculated symmetrical value multiplied by 2.7
 - a. Equivalent impedance
 6. Interrupting Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
 - a. Voltage
 - b. Calculated symmetrical fault current magnitude and angle

- c. Fault point X/R ratio
 - d. No AC Decrement (NACD) Ratio
 - e. Equivalent impedance
 - f. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a symmetrical basis
 - g. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a total basis
7. Equipment evaluation table including but not limited to AIC rating, X/R ratio, actual fault current, percent of actual to rated fault current, derated value.

C. Recommended Protective Device Settings:

1. Phase and Ground Relays:

- a. Current transformer ratio
- b. Current setting
- c. Time setting
- d. Instantaneous setting
- e. Recommendations on improved relaying systems, if applicable.

2. Special purpose relays

- a. Provide settings for all functions provided by special purpose relays such differential, reverse power, directional overcurrent, negative sequence, current unbalance, and multi-function relays for main and tie circuit breakers, generator management, transformer protection, feeder protection, motor protection, etc

3. Circuit Breakers:

- a. Adjustable pickups and time delays (long time, short time, ground)
- b. Adjustable time-current characteristic
- c. Adjustable instantaneous pickup
- d. Recommendations on improved trip systems, if applicable.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the electrical contractor in conjunction with Power Systems Analysis engineer.
- B. Make minor modifications to equipment as required to provide for conformance with short circuit and protective device coordination studies.
- C. Notify Owner in writing of any required major equipment modifications.

END OF SECTION

SECTION 26-0583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26-0533.16 - Boxes for Electrical Systems.
- B. Section 26-2726 - Wiring Devices.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Wiring Devices: As specified in Section 26-2726.
- B. Boxes: As specified in Section 26-0533.16.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.

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- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26-0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Outdoor photo controls.

1.02 RELATED REQUIREMENTS

- A. Section 26-0529 - Hangers and Supports for Electrical Systems
- B. Section 26-0533.16 - Boxes for Electrical Systems.
- C. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26-2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.03 REFERENCE STANDARDS

- A. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2020.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- F. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
 4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items except field quality related items and O/M documentation, in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- D. Shop Drawings:
 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
 2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- E. Field Quality Control Reports.
- F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: Include detailed information on device programming and setup.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01-6000 - Product Requirements, for additional provisions.
 2. Extra Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.
- I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 01-7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.
- C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.
- D. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.

- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
 - a. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
7. Sensitivity: Field adjustable.
8. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

B. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

- b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
- C. Wall Dimmer Occupancy Sensors:
 1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
 - b. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
- D. Ceiling Mounted Occupancy Sensors:
 1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
- E. Power Packs for Low Voltage Occupancy Sensors:
 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 3. Input Supply Voltage: Dual rated for 120/277 V ac.
 4. Load Rating: As required to control the load indicated on drawings.

2.03 OUTDOOR PHOTO CONTROLS

A. Button Type Outdoor Photo Controls

1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
2. Housing: Weather resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26-0533.16 as required for installation of lighting control devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
 - b. In-Wall Time Switches: 48 inches (1.2 m) above finished floor.
 - c. In-Wall Interval Timers: 48 inches (1.2 m) above finished floor.
 - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 - 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 1. Do not utilize equipment grounding conductor as a current carrying conductor for electronic switching/dimming/sensor devices.
 - 2. Include a grounded (neutral) conductor with switch leg.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26-2726.
- G. Provide required supports in accordance with Section 26-0529.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Identify lighting control devices in accordance with Section 26-0553.

J. Occupancy Sensor Locations:

1. Location Adjustments: Do not make adjustments to locations without obtaining approval from the Architect.
2. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
3. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
4. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

M. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

N. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

O. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

P. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

Q. Where indicated or required, provide cabinet or enclosure in accordance with Section 26-0533.16 for mounting of lighting control device system components.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test time switches to verify proper operation.
- E. Test outdoor photo controls to verify proper operation, including time delays where applicable.
- F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- G. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.
- F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.
- G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

- A. See Section 01-9113 - General Commissioning Requirements for commissioning requirements.

3.08 CLOSEOUT ACTIVITIES

- A. See Section 01-7800 - Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

END OF SECTION

SECTION 26-2100
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

- A. Section 03-3000 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.
- B. Section 26-0519 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26-0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26-0529 - Hangers and Supports for Electrical Systems.
- E. Section 26-0533.13 - Conduit for Electrical Systems.
- F. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26-2413 - Switchboards: Service entrance equipment.
- H. Section 31-2316 - Excavation.
- I. Section 31-2316.13 - Trenching: Excavating, bedding, and backfilling.
- J. Section 31-2323 - Fill: Bedding and backfilling.
- K. Section 33-7119 - Electrical Underground Ducts, Ductbanks, and Manholes.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Allowances:
 - 1. See Section 01-2100 - Allowances, for allowances affecting this section.
- B. Unit Prices:
 - 1. See Section 01-2200 - Unit Prices, for additional unit price requirements.
 - 2. Secondary:
 - a. Basis of Measurement: By the lineal foot (meter), for each configuration.

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- b. Basis of Payment: Includes all work designated to be provided by Contractor in "Division of Responsibility" under Part 2 article "Electrical Service Requirements" below, including purchase, delivery, and installation.

1.04 DEFINITIONS

- A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.05 REFERENCE STANDARDS

- A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.06 ADMINISTRATIVE REQUIREMENTS

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
 - 1. Verify the following with Utility Company representative:
 - a. Utility Company requirements, including division of responsibility.
 - b. Exact location and details of utility point of connection.
 - c. Utility easement requirements.
 - d. Utility Company charges associated with providing service.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
 - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

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- D. Utility Company charges associated with providing permanent service to be paid by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
 - 1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
 - 2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.07 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Utility Company letter of availability for providing electrical service to project.
- D. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.
- E. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.
 - 1. Obtain Utility company approval of shop drawings prior to submittal.
- F. Drawings prepared by Utility Company.
- G. Project Record Documents: Record actual locations of equipment and installed service routing.

1.08 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. IEEE C2 (National Electrical Safety Code).
 - 2. NFPA 70 (National Electrical Code).
 - 3. The requirements of the Utility Company.
 - 4. The requirements of the local authorities having jurisdiction.

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- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics: As indicated on drawings.
- C. Utility Company: As indicated on drawings.
- D. Division of Responsibility:
 - 1. Pad-Mounted Utility Transformers:
 - a. Transformer Vaults and Pads: Furnished and installed by Contractor per Utility Company requirements.
 - b. Transformers: Furnished and installed by Utility Company.
 - c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.
 - d. Transformer Protective Bollards: Furnished and installed by Contractor per Utility Company requirements.

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- e. Primary:
 - 1) Trenching and Backfilling: Provided by Contractor.
 - 2) Conduits: Furnished and installed by Contractor.
 - 3) Conductors: Furnished and installed by Utility Company.
- f. Secondary:
 - 1) Trenching and Backfilling: Provided by Contractor.
 - 2) Conduits: Furnished and installed by Contractor.
 - 3) Conductors: Furnished and installed by Contractor (Service Point at transformer).
- 2. Terminations at Service Point: Provided by Utility Company.
- 3. Metering Provisions:
 - a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
- E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 31-2316.13.

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- E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03-3000.
- F. Provide required protective bollards in accordance with Utility Company requirements.
- G. Provide required support and attachment components in accordance with Section 26-0529.
- H. Provide grounding and bonding for service entrance equipment in accordance with Section 26-0526.
- I. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26-0553.

3.04 PROTECTION

- A. Protect installed equipment from subsequent construction operations.

END OF SECTION

**SECTION 26-2413
SWITCHBOARDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

1.02 RELATED REQUIREMENTS

- A. Section 03-3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26-0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26-0529 - Hangers and Supports for Electrical Systems.
- D. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26-0573 - Power System Analysis.
- F. Section 26-2100 - Low-Voltage Electrical Service Entrance.
 - 1. Includes Utility Company contact information.
- G. Section 26-2513 - Low-Voltage Busways.
- H. Section 26-2813 - Fuses: Fuses for fusible switches.
 - 1. Includes requirements for spare fuses and spare fuse cabinets.
- I. Section 26-4313 - (DO NOT USE) Low Voltage AC Surge Protection Devices.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- F. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- J. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- K. UL 891 - Switchboards; Current Edition, Including All Revisions.
- L. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Service Entrance Switchboards:
 - 1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
 - 2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
 - 3. See Section 26-2100 for Utility Company contact information and additional requirements.
 - 4. Obtain Utility Company approval of switchboard prior to fabrication.

5. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
6. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items except field quality related items and O/M documentation, in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- D. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 4. Include documentation of listed series ratings upon request.
 5. Include documentation demonstrating selective coordination upon request.
- E. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.
- F. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 2 as production (routine) tests.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Field Quality Control Test Reports.

- I. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.
- J. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01-6000 - Product Requirements, for additional provisions.
 - 2. Enclosure Keys: Two of each different key.
 - 3. Electronic Trip Circuit Breakers: Provide one portable test set.
 - 4. Drawout Devices:
 - a. Handles Necessary for Racking of Devices: One for each electrical room containing switchgear with drawout devices.
 - b. Lifting Yokes: One of each different yoke required, for each electrical room containing drawout devices.
 - c. Portable Lifting Devices: One for each electrical room containing switchboards with drawout devices and no integral top rail-mounted lifting device.
 - d. Removable Covers: One for blocking each different opening size when device is temporarily removed from its compartment.
 - 5. See Section 26-2813 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Products: Listed, classified, and labeled by Underwriters Laboratories Inc. or testing firm acceptable to authorities having jurisdiction as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Switchboards:
 - 1. Eaton Corporation: www.eaton.com/#sle.
 - 2. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
 - 3. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- B. Substitutions: See Section 01-6000 - Product Requirements.
- C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- D. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 SWITCHBOARDS

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.
- D. Front-Connected Switchboards:
 - 1. Main Device(s): Individually-mounted.
 - 2. Feeder Devices: Panel/group-mounted.
 - 3. Arrangement: Front accessible only (not rear accessible), rear aligned.
 - 4. Gutter Access: Bolted covers.
- E. Service Entrance Switchboards:
 - 1. Listed and labeled as suitable for use as service equipment according to UL 869A.
 - 2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
 - 3. Comply with Utility Company requirements for electrical service.
 - 4. See Section 26-2100 for additional requirements.
- F. Switchboards With Busway Transitions: Configured for bussed connection to busway provided in accordance with Section 26-2513.
- G. Switchboards With Fire Pump Taps: Provide separate bussed vertical section with suitable lugs for fire pump connection to line side of main service disconnect device(s).
- H. Switchboards With Drawout Devices: Provide integral top rail-mounted lifting device where indicated.
- I. Service Conditions:
 - 1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
 - a. Altitude: Less than 6,600 feet (2,000 m).
 - b. Ambient Temperature:
 - 1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

- 2) Switchboards Containing Fusible Switches: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- J. Short Circuit Current Rating:
1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 2. Label equipment utilizing series ratings as required by NFPA 70.
- K. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- L. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- M. Bussing: Sized in accordance with UL 891 temperature rise requirements.
1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
 2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 4. Phase and Neutral Bus Material: Copper.
 5. Ground Bus Material: Copper.
- N. Conductor Terminations: Suitable for use with the conductors to be installed.
1. Line Conductor Terminations:
 - a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - b. Main and Neutral Lug Type: Mechanical.
 2. Load Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

b. Lug Type:

O. Enclosures:

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).

2. Finish: Manufacturer's standard unless otherwise indicated.

3. Enclosure Space Heaters:

a. Size according to manufacturer's recommendations for worst case ambient temperature to prevent condensation.

b. Heater Control: Thermostat.

c. Heater Power Source: Provide connection to transformer factory-installed in switchboard or suitable external branch circuit as indicated or as required.

P. Future Provisions:

1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.

Q. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26-4300, list switchboards as a complete assembly including surge protective device.

R. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.

a. Use zero sequence or residual ground fault detection method unless otherwise indicated.

b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

- S. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

T. Instrument Transformers:

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:

1. Interrupting Capacity:

- a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
- b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

2. Molded Case Circuit Breakers:

- a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- b. Minimum Interrupting Capacity:
- c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - 1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger, if/where electronic trip breakers are not otherwise required.
 - 2) Provide interchangeable trip units for circuit breaker frame sizes 150 amperes and larger. (frame size)
- d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - 1) Provide the following field-adjustable trip response settings:
 - (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
 - (b) Long time delay.

- (c) Short time pickup and delay.
 - (d) Instantaneous pickup.
 - (e) Ground fault pickup and delay where ground fault protection is indicated.
- e. Provide the following features and accessories where indicated or where required to complete installation:
- 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
3. Insulated Case Circuit Breakers:
- a. Description: Quick-make, quick-break, trip-free circuit breakers with two-step stored energy closing mechanism; standard 80 percent rated unless otherwise indicated; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
 - b. Trip Units: Solid state, microprocessor-based, true rms sensing.
 - c. Provide the following features and accessories where indicated or where required to complete installation:
 - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.04 SOURCE QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
 - 1. Dielectric tests.
 - 2. Mechanical operation tests.
 - 3. Grounding of instrument transformer cases test.
 - 4. Electrical operation and control wiring tests, including polarity and sequence tests.
 - 5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive switchboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.
- D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch (10 mm) between switchboard and wall.
- E. Provide required support and attachment in accordance with Section 26-0529.
- F. Install switchboards plumb and level.
- G. Unless otherwise indicated, mount switchboards on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 03-3000.
- H. Provide grounding and bonding in accordance with Section 26-0526.
- I. Install all field-installed devices, components, and accessories.
- J. Provide fuses complying with Section 26-2813 for fusible switches as indicated.
- K. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- L. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26-0573.
- M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- N. Provide filler plates to cover unused spaces in switchboards.
- O. Identify switchboards in accordance with Section 26-0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.

- B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's reports with submittals.
- C. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.
- E. Inspect and test in accordance with NETA ATS, except Section 4.
- F. Perform inspections and tests listed in NETA ATS, Section 7.1.
- G. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- H. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.
 - 1. Perform insulation-resistance tests on all control wiring with respect to ground.
 - 2. Test functions of the trip unit by means of secondary injection.
- I. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- J. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.
- K. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- L. Test shunt trips to verify proper operation.
- M. Correct deficiencies and replace damaged or defective switchboards or associated components.
- N. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

- B. Adjust alignment of switchboard covers and doors.

3.05 CLEANING

- A. See Section 01-7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.
- C. Repair scratched or marred surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01-7800 - Closeout Submittals, for closeout submittals.
- B. See Section 01-7900 - Demonstration and Training, for additional requirements.

3.07 PROTECTION

- A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

**SECTION 26-2416
PANELBOARDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 03-3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26-0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26-0529 - Hangers and Supports for Electrical Systems.
- D. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26-0573 - Power System Analysis: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- F. Section 26-2813 - Fuses: Fuses for fusible switches and spare fuse cabinets.
- G. Section 26-4313 - (DO NOT USE) Low Voltage AC Surge Protection Devices.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- F. NEMA PB 1 - Panelboards; 2011.
- G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- L. UL 67 - Panelboards; Current Edition, Including All Revisions.
- M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- N. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- O. UL 943 - Ground-Fault Circuit-Interruption; Current Edition, Including All Revisions.
- P. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
- Q. UL 1699 - Arc-Fault Circuit-Interruption; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items except field quality related items and O/M documentation, in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 - 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- D. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 - 2. Include wiring diagrams showing all factory and field connections.
- E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- F. Field Quality Control Test Reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01-6000 - Product Requirements, for additional provisions.
 - 2. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
 - 2. Panelboards Containing Fusible Switches: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Eaton Corporation: www.eaton.com.
- B. Schneider Electric; Square D Products: www.schneider-electric.us.
- C. Siemens Industry, Inc: www.usa.siemens.com.
- D. Substitutions: See Section 01-6000 - Product Requirements.

- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26-0573.
 - 3. Listed series ratings are not acceptable.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.

3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 - c. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Owner Metering: Comply with Section 26 27 13.
1. Provide power meters, multi-circuit meters, and integrated panelboard multi-circuit meters as indicated on drawings and elsewhere in specifications.
- K. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- L. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26-4313, list and label panelboards as a complete assembly including surge protective device.

- M. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
1. Ampere Rating: Not less than ampere rating of panelboard bus.
 2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
 3. Coil Voltage: As required for connection to control system indicated.
- N. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
 2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
 - a. Use zero sequence ground fault detection method unless otherwise indicated.
 - b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
 - c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.
- O. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- P. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- Q. Load centers are not acceptable.
- R. Provide the following features and accessories where indicated or where required to complete installation:
1. Feed-through lugs.
 2. Sub-feed lugs.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Products:
 - 1. 120/208 volts, 3-phase, 4-wire: minimum 10,000 AIC rating.
 - a. Eaton Cutler-Hammer type PRL 1a.
 - b. General Electric type AQ.
 - c. Schneider Square D type NQ
 - d. Siemens type P1
 - 2. 277/480 volts, 3-phase, 4-wire: minimum 14,000 AIC rating
 - a. Eaton Cutler-Hammer type PRL 2a or 3a, depending upon AIC rating
 - b. General Electric type AE
 - c. Schneider Square D type NF
 - d. Siemens type P2
 - 3. Substitutions: Not permitted.
- C. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- D. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Copper.
 - 3. Ground Bus Material: Copper.
- E. Circuit Breakers: Thermal magnetic bolt-on type.
- F. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide door-in-door trim with fully hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
 - a. Provide mechanical lugs.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - d. Temperature rating: 75 degree or 60/75 degree.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 150 amperes and larger, where electronic trip is not required.
 - b. Provide interchangeable trip units for circuit breaker frame sizes 250 amperes and larger, where electronic trip is not required.

5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - a. Provide electronic trip circuit breakers for all breakers 150A frame and larger
 - b. Provide the following field-adjustable trip response settings:
 - 1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
 - 2) Long time delay.
 - 3) Short time pickup and delay.
 - 4) Instantaneous pickup.
 - 5) Ground fault pickup and delay where ground fault protection is indicated.
 - c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
 - d. Provide communication capability where indicated: Compatible with system indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 - e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
8. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

9. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
10. Do not use tandem circuit breakers.
11. Do not use handle ties in lieu of multi-pole circuit breakers.
12. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
13. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
 - c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.05 SOURCE QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).

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- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26-0529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 03-3000.
- J. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling.
- K. Provide grounding and bonding in accordance with Section 26-0526.
 - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
 - 2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- L. Install all field-installed branch devices, components, and accessories.
- M. Provide fuses complying with Section 26-2813 for fusible switches as indicated.
- N. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- O. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- P. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26-0573.
- Q. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- R. Provide filler plates to cover unused spaces in panelboards.

- S. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads listed below:
 - 1. Fire detection and alarm circuits.
 - 2. Communications equipment circuits.
 - 3. Intrusion detection and access control system circuits.
 - 4. Video surveillance system circuits.
- T. Identify panelboards in accordance with Section 26-0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and any circuit breakers larger than 225 amperes. Tests listed as optional are not required, except for the following:
 - 1. Perform insulation-resistance tests on all control wiring with respect to ground.
 - 2. Test functions of the trip unit by means of secondary injection.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is required.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test AFCI circuit breakers to verify proper operation.
- G. Test shunt trips to verify proper operation.
- H. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- I. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

**SECTION 26-2726
WIRING DEVICES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates and covers.

1.02 RELATED REQUIREMENTS

- A. Section 26-0533.16 - Boxes for Electrical Systems.
- B. Section 26-0533.16 - Boxes for Electrical Systems
- C. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h, with Amendments (2017).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2014g, with Amendment (2017).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
- M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.
- N. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items except field quality related items and O/M documentation, in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
 1. Wall Dimmers: Include derating information for ganged multiple devices.
 2. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.

- D. Samples: One for each type and color of device and wall plate specified.
- E. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.
- F. Field Quality Control Test Reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Operation and Maintenance Data:
 - 1. Wall Dimmers: Include information on operation and setting of presets.
 - 2. GFCI Receptacles: Include information on status indicators.
 - 3. Surge Protection Receptacles: Include information on status indicators.
- I. Project Record Documents: Record actual installed locations of wiring devices.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01-6000 - Product Requirements, for additional provisions.
 - 2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.
 - 3. Extra Keys for Locking Switches: Two of each type.
 - 4. Extra Surge Protection Receptacles: Two of each type.
 - 5. Extra Wall Plates: One of each style, size, and finish.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide tamper resistant devices for 15- and 20- amp, 125- and 250V devices as required per NEC 406.12.
 - 1. Business offices, corridors, waiting rooms in clinics, medical and dental offices and outpatient facilities.
 - 2. Waiting rooms and lobbies
- E. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- F. Provide GFCI protection for receptacles installed in kitchens.
- G. Provide GFCI protection for receptacles serving electric drinking fountains.
- H. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
- C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
- D. Wiring Devices Installed in Unfinished Spaces: White with galvanized steel wall plate.
- E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

2.03 WALL SWITCHES

- A. Manufacturers:

1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 4. Substitutions: See Section 01-6000 - Product Requirements.
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable FS W-S-896; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 WALL DIMMERS

- A. Manufacturers:
1. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.
 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 4. Substitutions: See Section 01-6000 - Product Requirements.
- B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- C. Control: Slide control type with separate on/off switch.
- D. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.05 RECEPTACLES

- A. Manufacturers:
1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 5. Substitutions: See Section 01-6000 - Product Requirements.
 6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wall plates by the same manufacturer in locations indicated.
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498 and where applicable FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
 3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
 4. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
 4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
 5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
- E. USB Charging Devices:
1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
 - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
 - b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.
 2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Two Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.
- F. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.

2.06 WALL PLATES AND COVERS

- A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 3. Lutron Electronics Company, Inc; _____: www.lutron.com/#sle.
 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 5. Substitutions: See Section 01-6000 - Product Requirements.

6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wall plates by the same manufacturer in locations indicated.
- B. Wall Plates: Comply with UL 514D.
 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard; _____.
 3. Screws: Metal with slotted heads finished to match wall plate finish.
 - C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
 - D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
 - E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that openings in access floor are in proper locations.
- I. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.

- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26-0533.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: As indicated on the drawings.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 1. Do not utilize equipment grounding conductor as a current carrying conductor for electronic switching/dimming/sensor devices.
 - 2. Include a grounded (neutral) conductor with switch leg.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

- I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.
- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Install in-line GFCI devices in flush enclosure, adjacent to and matching finish of the panelboards serving the associated circuit. Coordinate placement with equipment in the area to ensure proper working clearances are maintained.
- N. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- O. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- P. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- Q. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- R. Identify wiring devices in accordance with Section 26-0553.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Inspect each surge protection receptacle to verify surge protection is active.
- G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26-2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 26-0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26-0529 - Hangers and Supports for Electrical Systems.
- C. Section 26-0548 - Vibration and Seismic Controls for Electrical Systems.
- D. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26-0573 - Power System Analysis.
- F. Section 26-2813 - Fuses.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items except field quality related items and O/M documentation, in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- D. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
 - 2. Include wiring diagrams showing all factory and field connections.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- G. Project Record Documents: Record actual locations of enclosed switches.
- H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01-6000 - Product Requirements, for additional provisions.
 - 2. See Section 26-2813 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Substitutions: See Section 01-6000 - Product Requirements.

- F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy or general duty as indicated; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26-0573.
 - 2. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
 - c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
 - d. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.

- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- M. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- O. Heavy Duty Switches:
 - 1. Comply with NEMA KS 1.
 - 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position where indicated.
- P. General Duty Switches:
 - 1. Conductor Terminations:

- a. Provide mechanical lugs.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.
- Q. Provide the following features and accessories where indicated or where required to complete installation:
1. Hubs: As required for environment type; sized to accept conduits to be installed.
 2. Integral fuse pullers.
 3. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.
 4. Viewing Window: Positioned over switch blades for visual confirmation of contact position with door closed.
 5. Interlocked Receptacle: Integral pre-wired three phase, three wire, grounded type receptacle interlocked with switch mechanism to prevent insertion or removal of plug with switch in the ON position and to prevent switch from being placed in the ON position without matching plug inserted. Provide receptacle configuration as required to accept plug as indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

- D. Provide required support and attachment in accordance with Section 26-0529.
- E. Provide required seismic controls in accordance with Section 26-0548.
- F. Install enclosed switches plumb.
- G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- H. Provide grounding and bonding in accordance with Section 26-0526.
- I. Provide fuses complying with Section 26-2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Identify enclosed switches in accordance with Section 26-0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

**SECTION 26-5100
INTERIOR LIGHTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Drivers and power supplies.
- E. Emergency power supply units.
- F. Accessories.

1.02 SCOPE OF WORK

- A. Furnish and install a lighting fixture of the type indicated by designator at each location shown on the drawings. All materials, accessories, components and any other equipment necessary for the complete and proper installation and operation of the lighting fixtures shall be furnished by the Contractor, including those not usually indicated on the drawings or specified, but that are necessary for the proper installation and operation of the fixtures.
- B. Specifications and drawings are intended to convey the main features, function, and character of the fixtures only, and do not necessarily illustrate or set forth every item or detail necessary for completion of the work.
- C. Where design intent is unclear in the documents, the Contractor shall contact the Architect in writing for clarification prior to proceeding with the item in question.
- D. Where Contractor's BIM is used to produce, document, or otherwise coordinate the locations of lighting fixtures, it is the Contractor's responsibility to confirm that all lighting products to be provided for construction will fit into the intended locations.

1.03 RELATED REQUIREMENTS

- A. Section 26-0529 - Hangers and Supports for Electrical Systems.
- B. Section 26-0533.16 - Boxes for Electrical Systems.
- C. Section 26-0553 - Identification for Electrical Systems: Identification products and requirements.

1.04 REFERENCE STANDARDS

- A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2020.
- H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- L. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- M. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.
- N. ASHRAE/IESNA Standard 90.1 - Energy Standard for Buildings (current version or most recent approved version by the local authority.)
- O. IECC - International Energy Conservation Code (current version or most recent approved version by the local authority.)

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports,

anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.06 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submittals shall be submitted for review for all lighting fixtures, lamps (as applicable), drivers/ballasts/power supplies (as applicable) in accordance with the requirements of the Contract Documents. Shop drawing submittals for multiple types must be submitted with a contents page listing each fixture by type designation with manufacturer, model number, lamp model number (as applicable), driver/ballast/power supply (as applicable.) Individual catalog cuts or drawings shall include complete fixture model numbers. Catalog cuts or drawings lacking sufficient detail to indicate compliance with Contract Documents will not be acceptable. The contents page, catalog cut sheets and custom shop drawings shall be arranged in alphanumeric order by fixture type designation. Submittals lacking organization may be rejected without review.
- C. Review of shop drawings or samples does not waive contract requirements. Review of the shop drawings, submittals or samples does not relieve the Contractor from responsibility for deviations from the specifications or drawings, unless a letter is provided noting such deviations at the time of submission and received written acceptance for such deviations from the Architect and/or the Lighting Designer. Approval of shop drawings or samples does not relieve the Contractor from responsibility for errors in the shop drawings or samples. Contractor shall be fully responsible for lighting fixtures that are manufactured or installed without reviewed shop drawings and for fixtures not manufactured in accordance with the requirements of the Architect and/or the Lighting Designer shop drawing review to the extent that they may need to be removed and replaced entirely.
- D. The design team reserves the right to make minor modifications to the specifications at the time of submittal review such that there is either no change in cost or any cost changes can be carried by a contingency or as otherwise acceptable to the Owner.

- E. Preliminary lighting controls submittals shall be submitted simultaneously with lighting fixtures indicating compatibility between the fixture type control method, driver type, load, and control method.
- F. The Contractor shall identify any long lead time or lighting fixture delivery issues that may adversely affect the project schedule, and immediately bring them to the attention of the Owner, Architect and/or Lighting Designer. The Contractor shall provide all products to the jobsite on time. Under no circumstances shall the Contractor delay the release of any submittals to the design team for review and approval such that any delay would compromise the project schedule or instigate a need for a product substitution. Allow a minimum of 10 weeks for the delivery of standard products, and 20 weeks for custom products. Also, allow a minimum of 2 weeks for any subsequent submittal review by the design team and up to 3 weeks for the initial review of the complete lighting package.
- G. Photometric Data:
 - 1. Provide complete photometric data for lighting fixtures produced in accordance with methods of Illuminating Engineering Society of North America.
 - 2. Upon request, provide illumination level calculation for typical areas or for areas where specialty fixtures are used.
- H. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
 - 3. For architecturally integrated lighting fixtures, verify field dimensions and include them on shop drawings showing exact locations of fixtures. Where applicable, shop drawings shall include wiring diagrams, scale plans and details showing the method of installation of components, mounting hardware, secondary feeds, as well as a complete bill of materials. Changes to shop drawings by the manufacturer or Contractor are to be 'clouded' and dated prior to resubmission. No variation from the general arrangement and details indicated in the Contract Documents shall be made on the shop drawings, unless required to suit the actual conditions on the premises, and then only with the written acceptance of the Architect and/or Lighting Designer. All variations must be clearly marked as such on drawings submitted for review.
- I. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed

accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 - c. Include electrical characteristics: input voltage in volts, input current in amps, input power in watts.
 - d. Include data for total light output in lumens, luminaire efficacy in lumens per watt
 - e. Include power supply, thermal, optical and fixture losses.
 2. LED Drivers: Include wiring diagram and list of compatible source units.
 3. Lamps/source module: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
 4. Emergency Power Supply Unit: Include list of compatible lamp/source configurations and associated lumen output.
- J. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.
- K. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
1. Field quality control reports
- L. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- M. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01-6000 - Product Requirements, for additional provisions.
 2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
- N. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.07 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with a minimum of five years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.09 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

- A. See Section 01-7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide a minimum of five years of manufacturer warranty for LED luminaires, including drivers.
- C. Provide five year pro-rata warranty for batteries for emergency lighting units.
- D. Provide ten year pro-rata warranty for batteries for self-powered exit signs.
- E. Provide five year full warranty for emergency power supply units.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 01-6000 - Product Requirements.
 - 1. Bidders wishing to obtain approval on manufacturers other than those specified by name and catalog number series in LIGHTING FIXTURE SCHEDULE shall

submit their requests no later than ten (10) business days before the bid opening. Acceptance will be in the form of an addendum to the specifications issued to all prospective bidders indicating that the additional brand or brands are approved as equals to those specified per the requirements and scope of the project. If the bidders do not elect to obtain prior approval during the time so specified, the Owner has no obligation to review or consider any such article after the contract award.

2. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - a. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - b. Agrees to provide the same warranty for the substitution as for the specified product.
 - c. 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.
 - d. Waives claims for additional costs or time extension that may subsequently become apparent.
3. Any substitutions inserted into a submittal package may be rejected on an individual basis or at the discretion of the design team, may invalidate the entire submittal. Any substitution may be rejected without review or consideration, at any time.
4. Under special circumstances, as authorized by the Owner, Architect, or Lighting Designer, substitution proposals may be requested from the Contractor for the purpose of cost reduction. Such proposals shall include individual unit prices for the specified products and for the proposed substitutions. Distributor and Contractor markup costs shall also be disclosed in the proposal. Any differences in installation costs for proposed substitutions shall also be provided.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, sources, drivers, power supplies, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
 - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- I. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
 - 1. LED Tape - General Requirements:
 - a. Listed.
 - b. Designed for field cutting in accordance with listing.
- J. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Sealed maintenance-free nickel cadmium unless otherwise indicated.
2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.
2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

1. Self-Powered Exit Signs:

- a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- c. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. LED Drivers:

1. Manufacturer limitations: All LED drivers shall be supplied by the light fixture manufacturer and specifically paired with each light source so that the LED driver combination will operate per published performance, and is compatible with control method indicated. Where possible, all fixture drivers shall be of the same family/series and shall be supplied by a single manufacturer.
2. General Requirements:
 - a. Driver shall operate for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.
 - b. For some LED fixture, remote drivers are required.
 - 1) It is the contractor responsibility to properly size and otherwise 'engineer' the complete LED system to account for wire size, voltage drop, ambient conditions (dry/wet, temperature, dimmability, etc.)
 - 2) Each manufacturer should be contacted regarding confirmation of final installation details and arrangements. Contract documents may or may not indicate anticipated locations for remote drivers, but final locations will be subject to field conditions and are the responsibility of the contractor.
 - c. Wherever available, provide dual voltage (120/277V) driver units.
 - d. Integral thermal protection to automatically reduce power output to protect LED drive and LED light engine/fixture from damage due to over-temperature conditions that exceed the LED driver's maximum operating temperature at the calibration point.
 - e. Drivers shall be designed and tested to withstand electrostatic discharges incurred during manufacturing, installation, or field troubleshooting without impairment of performance when tested according to IEC 61000-4-2.
 - f. Drivers shall be designed and tested to withstand Category A surges of 4,000V according to IEEE C62.41.2 without impairment of performance.
 - g. Drivers shall be Class A sound rating, inaudible in a 27 dBA ambient noise condition.
 - h. Meet NEMA 410 inrush requirements for mitigating inrush currents with solid state lighting sources.

3. Dimming Range: Refer to LIGHTING FIXTURE SCHEDULE. Where dimming range is not indicated, request clarification from the architect prior to submitting bid. As a minimum, ten percent relative light output unless dimming capability to lower level is indicated, without flicker.
4. Control Compatibility: Fully compatible with the dimming controls to be installed.
5. Product(s):
 - a. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

2.06 LED EMERGENCY POWER SUPPLY UNITS

- A. Description: Self-contained LED emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924, UL 1310 certified, and compliant with CEC Title 20 (California Energy Code)
- B. Compatibility:
 1. Drivers: Compatible with standard LED drivers operating 20-50V DC, or as indicated for associated fixture model.
- C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected fixtures to the LED emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- D. Universal input 120-277 VAC, 50/60 Hz
- E. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.
- F. Operating Temperature: From 32 degrees F (0 degrees C) to 122 degrees F (50 degrees C) unless otherwise indicated or required for the installed location.
- G. Five (5) Year Warranty
- H. Accessories:
 1. Provide compatible accessory remote combination test switch/indicator light where indicated.

2.07 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26-0533.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Provide required support and attachment in accordance with Section 26-0529.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.
 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
 4. Secure pendant-mounted luminaires to building structure.
 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
 7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- H. For fixtures weighing 56 pounds or more in Seismic Design Categories D, E, or F, provide four galvanized steel safety wire(s), minimum 12 gauge, connected from each corner of each recessed luminaire to building structure.
- I. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- J. Suspended Luminaires:
1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
 4. Install canopies tight to mounting surface.
 5. Unless otherwise indicated, support pendants from swivel hangers.

- K. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- L. Install accessories furnished with each luminaire.
- M. Bond products and metal accessories to branch circuit equipment grounding conductor.
- N. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from circuit indicated. Bypass local switches, contactors, or other lighting controls.
- O. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from circuit indicated. Bypass local switches, contactors, or other lighting controls.
- P. Emergency Power Supply Units:
 - 1. For field-installed units, install inside luminaire unless otherwise indicated. Where installation inside luminaire is not possible, install on top of luminaire.
 - 2. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal ballast(s) in luminaire. Bypass local switches, contactors, or other lighting controls.
- Q. Identify luminaires connected to emergency power system in accordance with Section 26-0553.
- R. Burn-In: Operate fixtures at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps/sources that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 01-7800 - Closeout Submittals, for closeout submittals.
- B. See Section 01-7900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 26-5600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Ballasts.
- C. Poles and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03-3000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
- B. Section 26-0529 - Hangers and Supports for Electrical Systems.
- C. Section 26-0533.16 - Boxes for Electrical Systems.
- D. Section 26-2726 - Wiring Devices: Receptacles for installation in poles.
- E. Section 26-2813 - Fuses.

1.03 REFERENCE STANDARDS

- A. ANSI O5.1 - American National Standard for Wood Poles - Specifications and Dimensions; 2017.
- B. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- C. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- D. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- E. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- G. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

- I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Submit all items except field quality related items and O/M documentation, in a single, comprehensive package for review. Individual submissions for each line item will not be accepted.
- C. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
 - 3. Provide structural calculations for each pole proposed for substitution.
- D. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 - 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
 - 3. Lamps: Include rated life and initial and mean lumen output.

4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- E. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.
- F. Samples:
1. Provide one sample(s) of each specified luminaire where indicated.
 2. Provide one sample(s) of each custom luminaire.
 3. Provide one sample(s) of each luminaire proposed for substitution upon request.
 4. Provide one sample of each product finish illustrating color and texture upon request.
- G. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
- H. Field Quality Control Reports.
1. Include test report indicating measured illumination levels.
- I. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- J. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01-6000 - Product Requirements, for additional provisions.
 2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
 3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
 4. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.
 5. Touch-Up Paint: 2 gallons (8 liters), to match color of pole finish.

- L. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.08 WARRANTY

- A. See Section 01-7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 01-6000 - Product Requirements.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26-0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 26-0529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Pole-Mounted Luminaires:
 - 1. Maintain the following minimum clearances:
 - a. Comply with IEEE C2.
 - b. Comply with utility company requirements.
 - c. _____.
 - 2. Foundation-Mounted Poles:
 - a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03-3000.
 - 1) Install anchor bolts plumb per template furnished by pole manufacturer.
 - 2) Position conduits to enter pole shaft.
 - b. Install foundations plumb.
 - c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - d. Tighten anchor bolt nuts to manufacturer's recommended torque.
 - e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
 - f. Install anchor base covers or anchor bolt covers as indicated.
 - 3. Embedded Poles: Install poles plumb as indicated.
 - 4. Grounding:

- a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
- 5. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
- 6. Install non-breakaway in-line fuse holders and fuses complying with Section 26-2813 in pole handhole or transformer base for each ungrounded conductor.
- 7. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26-2726 in designated poles.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

- A. See Section 01-4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.
- E. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.06 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 27-0500
COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Structured cabling Systems.
- B. Cable management.
- C. Security system - access control and closed circuit television.
- D. Nurse Call and Code Blue System.
- E. CATV (Cable Television)
- F. Intercom System.

1.02 RELATED SECTIONS

- A. Section 27 0528 – Communications Pathways
- B. Section 27 1500 – Communications Horizontal Cabling
- C. Section 27 1800 – Communications Testing

1.03 RELATED REQUIREMENTS

- A. Related Work Specified Under Other Divisions
 - 1. Foundations and pads required for equipment furnished under this Division.
 - 2. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.
 - 3. Flashing of conduits into roofing and outside walls.
 - 4. Heating, ventilating, and air conditioning equipment.
 - 5. Cutting and patching for low voltage systems Work, except for errors and omissions under this Division.
- B. Related Work - Owner Furnished Equipment And System
 - 1. Audio-visual systems.
 - 2. CATV head-end electronics.
 - 3. Voice and Data network electronics.

1.04 REFERENCE STANDARDS

- A. The Contractor's performance of the work shall comply with applicable federal, state and local laws, rules and regulations.
 - 1. The Contractor shall give required notices, shall procure necessary governmental licenses, permits, and inspections and shall pay without burden to Owner's Representative, all fees and charges in connection therewith unless specifically provided otherwise.
 - 2. In the event of violation, the Contractor shall pay all fines and penalties, including attorney's fees and other defense costs and expenses in connection therewith.

- B. Federal Communications Commission
 - 1. Equipment requiring FCC registration or approval shall have received such approval and shall be appropriately identified.

- C. Codes, Standards and Ordinances: Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (National Electrical Code), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:
 - 1. ANSI/NECA/BICSI-568 -- Standard for Installing Commercial Building Telecommunications Cabling
 - 2. ANSI/TIA/EIA Standards
 - 3. ANSI/TIA/EIA-568-B.1 -- Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements
 - 4. ANSI/TIA/EIA-568-B.2 -- Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
 - 5. ANSI/TIA/EIA-568-B.3 -- Optical Fiber Cabling Components Standard
 - 6. ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces
 - 7. ANSI/TIA/EIA-606(A) -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - 8. ANSI/TIA/EIA-607(A) -- Commercial Building Grounding and Bonding Requirements for Telecommunications
 - 9. ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

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10. ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant
11. ANSI/TIA/EIA-758(A) -- Customer-Owned Outside Plant Telecommunications Cabling Standard
12. TIA/EIA TSB 67 - Transmission Performance Specifications for Field Testing of Twisted - Pair Cabling Systems.
13. Install cabling in accordance with the most recent edition of BICSI(r) publications:
 - a. BICSI -- Telecommunications Distribution Methods Manual
 - b. BICSI -- Cabling Installation Manual
 - c. BICSI -- LAN Design Manual
 - d. BICSI - Customer-Owned Outside Plant Design Manual
14. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached. If the contractor should note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of Owner's Representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.
 - a. American Society for Testing and Materials (ASTM): ASTM E. 814 - Fire Tests of Through - Penetration Firestops.
 - b. Underwriters Laboratories, Inc. (UL): U.L. 1479 - Fire Tests of Through - Penetrations Firestops.
 - c. Underwriters Laboratories, Inc. (UL): U.L. 1310 – Standard for class 2 Power Units
 - d. Underwriters Laboratories, Inc. (UL): U.L. 60601-1 – Medical Electrical Equipment Safety
 - e. Underwriters Laboratories, Inc. (UL): U.L. 60950-1 – Information Technology Equipment Safety
 - f. Underwriters Laboratories, Inc. (UL): U.L. 1069 – Standards for Hospital Signaling and Nurse Call Equipment
 - g. Underwriters Laboratories, Inc. (UL): U.L. 2560 – Standard for Emergency Call Systems for Assisted Living and Independent Living Facilities

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- h. National Fire Protection Association (NFPA): NFPA 70 - National Electrical Code.
- i. NFPA 75 – Standard for the Fire Protection of Information Technology Equipment
- j. NFPA 76 – Standard for the Fire Protection of Telecommunications Facilities
- k. Americans with Disabilities Accessibility Guidelines.
- l. Code of Federal Regulations, Title 29, Chapter XVII, Part 1910 (OSHA).
- m. International Building Code (IBC).

1.05 QUALITY ASSURANCE

- A. Comply with applicable local, state and federal codes.
- B. Comply with applicable requirements of recognized industry associations which produce standards for the various trades.
- C. Warrant work under this specification against faulty material or Workmanship in accordance with Division 01. If the project is occupied or the systems placed in operation in several phases at the request of Owner's Representative, then the warranty of each system or piece of equipment used shall begin on the date of substantial completion for each phase. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.
- D. Equipment and material provided under this Division shall be periodically inspected and serviced by competent installers. This function becomes the responsibility of Owner's Representative once the system is accepted by Owner's Representative. The one year material and Workmanship warranty is not intended to supersede normal inspection or service and shall not be construed to mean the Contractor shall provide free service for normal maintenance items such as periodic cleaning and adjustment due to normal use, nor to correct without charge, breakage, maladjustment, and other trouble caused by improper maintenance.
- E. Upon completion of contract and progressively as work proceeds, clean-up and remove dirt, debris and scrap materials. Maintain the premises in a neat and clean condition at all times during construction. Protect and preserve access to head-end equipment at all times. Clean items with factory finishes. Touch-up minor damage to surfaces; refinish entire piece of equipment when sustained major damage. All electronics must be protected from dust and other airborne debris.

1.06 COMPLETENESS OF WORK

- A. The Contract Documents depict low voltage systems which are intended to be complete and functioning systems. All products, materials, labor, and programming

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necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the contractor.

- B. Catalog numbers referenced throughout this Division's drawings and specifications are intended to convey a general understanding of the type of quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra charge shall be allowed because a catalog number is found to be incomplete or obsolete.

1.07 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Submittal to bear Contractor's stamp of approval evidencing they have been examined and checked same and information contained therein is in accordance with contract requirements. Deviations to be clearly marked. "No Exception taken" response to shop drawings is not to be construed as permitting departure from the contractual documents.
- C. Product Data
 - 1. Within fifteen (15) days after contract has been awarded, submit to Designer for review a complete list of materials, equipment, and accessories proposed for use, listing the item and manufacturer's name only.
 - a. This listing shall be used as the Table of Content for the submittal.
 - b. The header/title page shall clearly indicated specification number and title.
 - 2. Based upon aforementioned approved listing, Contractor to submit complete brochures and shop drawings of all materials, fixtures, and equipment that he proposes to use giving the names of manufacturers, trade name and specific catalog numbers.
 - 3. Individual functional systems including, but not limited to, structured cabling, nurse call, video surveillance and access control, where applicable, are required to be submitted as complete packages, inclusive of all major material components. Submittal packages which are not inclusive of complete system components will be rejected.
 - 4. Brochures to be submitted in time to allow fifteen (15) days from date of receipt in the consultant's office before final approval or disapproval is required to meet construction schedule. Submittal to bear Contractor's stamp of approval evidencing they have been examined and checked same and information contained therein is in accordance with contract requirements. Deviations must be clearly marked. "No Exception taken" response to shop drawings is not to be construed as permitting departure from the contractual documents.

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5. The above-mentioned brochures to be submitted and approved before any materials are ordered.
 6. Proposed items must be clearly indicated when other items are shown on same sheet. When proposing items other than those specified, brochures to contain both specified item sheets and proposed item sheets for ease of comparison. On request from Designer, samples shall be submitted and/or set up, as directed, for inspection and approval. Samples will be returned to Contractor.
 7. Submittals with product pages not clearly identifying proposed product will be rejected.
- D. Shop Drawings: Submit specific shop drawings using computer drafting software and actual floor plans for major materials where called for or when requested by Owner's Representative for the following:
1. Legend indicating all symbols used in shop drawings correlating to product data booklet.
 2. Shop drawing symbols shall be identical to contract drawings. If different symbols are necessary, provide table showing which shop drawing symbol equates to each contract drawing symbol.
 3. Shop drawings shall be numbered in accordance with contract drawing numbers and appended to indicate the system covered. Provide a legend of drawings on the cover sheet.
 4. Shop drawing sheets shall contain the project name, project location, project number, submittal number (and letter) and name and address of vendor contact responsible for answering questions related to the submittal.
 5. Shop drawings shall be produced in AutoCAD or Revit on architectural backgrounds provided by the project design team.
 6. Dimensional layout of all communication rooms, drawn to scale, with equipment locations shown therein. Label walls with rating requirements to verify understanding of architectural documents. Clearances are to be in accordance with manufacturer and industry standards. Low voltage systems equipment submittals will be rejected without dimensioned room or equipment location layouts.
 7. Detailed plan views of telecommunications rooms showing
 - a. equipment racks, cable supports, and termination hardware.
 - b. Rack layouts and wall elevations.
 8. Proposed cable routing indicated on floor plan.

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9. Proposed cable numbering indicated on the floor plans.
 10. Clearly indicate all power, conduit and sleeve requirements.
 11. Indicate cable management hardware and cable routing within all communications rooms.
 12. Provide all back box requirements specifically noting any deviations from the back boxes shown on the telecommunications drawings.
 13. Shop drawings shall include equipment and device layers as shown on the contract drawings for the system submitted and all related equipment and devices (example: television system shop drawings should show related nurse call stations and vice-versa).
 - a. All unnecessary layers should be turned off.
 14. Proposed system layout on project floor plan.
 15. Identify equipment dimensions and their distance from adjacent walls, floor, ceilings, door frames, counters, back-splash, etc. Clearly denote electrical requirements on interior elevations.
 16. All applicable riser diagrams.
 17. Proposed cable routing indicated on floor plan.
 18. Proposed cable numbering indicated on the floor plans.
 19. Clearly indicate all power, conduit and sleeve requirements.
 20. Interior elevations of proposed equipment located in all communications rooms.
 21. Identify equipment dimensions and their distance from adjacent walls, floor, ceilings, door frames, counters, back-splash, etc. Clearly denote electrical requirements on interior elevations.
 22. Indicate cable management hardware and cable routing within all communications rooms.
 23. Provide all back box requirements specifically noting any deviations from the back boxes shown on the telecommunications drawings.
- E. Assurance/Quality Control Submittals
1. Proposed test forms for fiber riser, copper riser and horizontal UTP cable.
 2. Documentation of manufacturer's qualification of contractor as an approved Value Added Reseller (VAR) or installer of the proposed cabling solution.

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3. Certificate of insurance. Contractor cannot begin installation of the system or be paid for any material or labor until this document is provided.
4. Contractor shall submit faceplate sample to General Contractor for coordination with electrical device cover plates for color and texture. Approval must be obtained before purchasing and installing face plates.
5. Documentation to provide certification for a current BICSI RCDD to manage all installations and testing procedures. The BICSI representative must be an employee of the Contractor.

F. OPERATING AND MAINTENANCE MANUALS

1. Prior to final acceptance of the project, furnish to Owner's Representative complete bound sets of operation and maintenance manuals of instructions for operation and maintenance of all pieces of equipment and systems provided under this Division of specifications.
2. Manuals to also include all submittal data on all materials and equipment. Clearly indicate items provided on this project. Included a list giving name and address of nearest supply house which carry the spare parts and name and address and phone number of Installation Contractor to be given to Owner's Representative.
3. The following data are required:
 - a. Operating and maintenance instructions.
 - b. Spare parts lists.
 - c. Copies of approved submittal data.
 - d. Warranty information including any required test results.
4. Arrange each set of data in an orderly way,
5. Submit as PDF copies of completed "record drawings" on thumb drive or via file share program to Owner's Representative for distribution.

G. RECORD DRAWINGS

1. Keep a set of prints at the job site exclusively for recording deviations from the construction drawings.
 - a. Mark deviations in colored pencils so that work of various systems can be easily identified.
2. Record drawings shall include marked up floor plans showing outlet locations, type of cable, and cable label identification.

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3. Record locations and depths of buried and concealed conduits from fixed, easily identifiable objects, such as building walls. Where conduits are concealed in walls, indicate distances off of building corners or other building features not likely to be disturbed by future alterations.
4. When work is completed, record all deviations in an electronic format using AutoCAD in a format usable to Owner's Representative. Coordinate this format with Owner's Representative.
5. Submit as PDF copies of completed "record drawings" on thumb drive or via file share program to Owner's Representative for distribution.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment used in carrying out these specifications are to be new and have UL listing, or listing by other recognized testing laboratory when such listings are available. Specifications and drawings indicate name, type and catalog numbers of materials and equipment to be used as "standards" shall not be construed as limiting competition. Contractor may, at his option, use materials and equipment when, in the judgment of Owner's Representative, they are equivalent to that specified. Prior approval of substitutions must be given prior to submittals.

PART 3 - EXECUTION

3.01 GENERAL

A. DELIVERY AND STORAGE

1. Insofar as possible, deliver items in manufacturers' original unopened packaging. Where this is not practical, cover items with protective materials, to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.
2. Store items in a clean dry place and protect from damage.

3.02 COORDINATION

- A. Insofar as it is possible to determine in advance, advise the other trades to leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should contractor neglect doing this, any cutting and/or patching required is to be done at this contractor's expense.
- B. Visit site and be informed of conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work involved.

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- C. Coordinate with other Divisions to ensure proper power requirements, grounding, fireproofing and interlocking controls between the fire alarm system, egress doors, nurse call system, and Owner furnished systems, where applicable.
- D. Notify other tradesmen of any deviations or special conditions necessary for the installation of work. Interferences between work of various contractors is to be resolved prior to installation. Work installed not in compliance with specifications and drawings and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled without additional cost to Owner's Representative.
- E. Coordinate with local telephone and cable service providers to assure that proper points of service, demarcation location and grounding requirements are in accordance with contract drawings. Duct bank is to be provided by Division 26. This contractor shall be involved regarding discussions about services to the building.
 - 1. Coordinate with other trades to provide wall and ceiling access panels wherever required for access to communication equipment.

3.03 INTENT:

- A. These sections of specifications and drawings form a complete set of documents for the communication systems for this project. Neither is complete without the other. Any item mentioned in one shall be as binding as though mentioned in both.
- B. The intent of these specifications and drawings is to form a guide for a complete systems installation. Where an item is reasonably necessary for a complete system but not specifically mentioned, such as conduit sleeves, pull boxes, fittings, expansion fittings, support hangers, etc., provide same without additional cost to Owner's Representative.
- C. Telecommunications Room (TR) layouts indicated on drawings are diagrammatical only. Exact location of outlets and equipment is to be coordinated and governed by project conditions. The Designer reserves the right to make any reasonable changes (approximately 6 feet) in location of junction boxes, or equipment prior to roughing in of such without additional cost to Owner's Representative.

3.04 DEVIATIONS:

- A. No deviations from specifications and drawings to be made without full knowledge and consent of Designer.
- B. Should Contractor find during progress of work that existing conditions make desirable a modification of the requirements of any particular item, report such item promptly to Designer for his decision and instructions.

3.05 MAIN HORIZONTAL PATHWAY/RACEWAY

- A. Unless otherwise noted on the drawings, all communications/low voltage systems cabling shall be routed above accessible corridor ceilings via cable tray or j-hook supports. Cabling shall be segregated by function as follows:
 - 1. Voice/data cabling
 - 2. CATV cabling
 - 3. Security
 - 4. All other systems as defined by Owner/designer

3.06 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

- A. Under other Divisions, provide trenching, excavation, and backfilling. Coordinate all requirements with trades. Failure to properly coordinate this effort resulting in additional trenching, excavation, backfilling, or repairs shall be performed without additional cost to Owner.

3.07 PLYWOOD BACKBOARD AND WALL BACKING

- A. As directed by the responsibility matrix, provide 4' W x 8' H x 3/4" D fire retardant A/C grade plywood backboard as indicated in all Communication Rooms. Plywood is to be installed 6" above finished floor and painted with two coats of fire retardant paint.
- B. Under other Divisions, provide appropriate backing in walls as required for mounting brackets and other wall mounted equipment per manufacturer requirements.

3.08 FIRESTOPPING

- A. Select appropriate type or types of through penetration firestop devices or systems appropriate for each type of communications penetration and base each selection on criteria specified herein.
- B. Selected systems shall not be less than the hourly time delay ratings indicated in the Contract Documents for each respective fire-rated floor, wall, or other partition of building construction. Firestop for each type of communications penetration shall conform to requirements of an independent testing laboratory design drawing or manufacturer's approved modification when used in conjunction with details shown on the Drawings.
- C. Perform all necessary coordination with trades constructing floors, walls, or other partitions of building construction with respect to size and shape of each opening to be constructed and device or system approved for use in each instance.
- D. Coordinate each firestop selection with adjacent work for dimensional or other interference and for feasibility. In areas accessible to public and other "finished" areas,

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firestop systems work shall be selected, installed, and finished to the quality of adjacent surfaces of building construction being penetrated.

- E. Use materials that have no irritating or objectionable odors when firestopping is required in existing buildings and areas that are occupied.
- F. Provide damming materials, plates, wires, restricting collars, and devices necessary for proper installation of firestopping. Remove combustible installation aids after firestopping material has cured.
- G. All firestops shall be installed in accordance with the manufacturer's instructions in order to maintain the specific rating assigned by the independent testing laboratory.
- H. Existing raceways, cable trays, and cabling that penetrate existing building construction shall be firestopped to the extent necessary to fill cavities that may exist between existing building construction and existing communications penetrations or existing conduit sleeve, and between existing conduits and existing conduit sleeve.
- I. If required by inspecting authorities:
 - 1. Expose and remove firestopping to the extent directed by inspecting authority to permit his or her inspection.
 - 2. Reinstall new firestopping and restore Work where removed for inspection.

3.09 TESTS

- A. Where such systems have been installed or modified by the contractor, and prior to final observation and acceptance, test and leave in satisfactory operating condition, such systems and equipment including, but not limited to the following:
 - 1. Structured Cable System
 - 2. Grounding.
 - 3. Firestopping of all sleeves and conduits.
 - 4. Nurse Call and Code Blue system.
 - 5. Access control and security camera system.
 - 6. Telephone and LAN systems.
 - 7. Overhead Paging (public address) system.
 - 8. CATV/MATV distribution systems.

3.10 INSPECTION FEES AND PERMITS

- A. Obtain and pay for all necessary permits and inspection fees required for communication systems installation.
- B. In states where required by the department of health, the nurse call installer / manufacturer representative is required to attend the health department final inspections to assist in the demonstration and testing of the nurse call system.

3.11 OBSERVATIONS

- A. When field observation services are a part of the project scope, the Designer will provide periodic observation of the progress of work specified herein. Purpose of the observation is to ensure compliance of Contractor's work with specifications and drawings. The Designer may also observe tests required of this Contractor as called for in other sections of specifications.
- B. Specifications and drawings represent work to be done in view of total project requirements. Final location of conduits, jacks, outlets, components, etc., to eliminate possible conflict with other trades is responsibility of this Contractor. Contractor to provide all supervision required for his personnel to ensure that installation is made in accordance with specifications and drawings and all safety rules and regulations are observed. In event of conflicts of work on project with other trades, Contractor is to make every reasonable effort to resolve conflict through meetings and discussions with other parties involved, by preparation of drawings or other appropriate action. Only after this has been done shall Designer assistance be requested through the RFI process.
- C. When Designer is requested to visit the project to aid in resolution of conflicts, or for witnessing tests, they shall be given a minimum of 48 hours notice prior to time their presence is requested at job site.

3.12 TRAINING

- A. The supplier or manufacturer shall provide thorough training of all staff assigned to those areas receiving new systems and equipment. This training shall be developed and implemented to address two different types of staff. The end users shall be trained on the features and functions of the systems, and the engineering or maintenance department will be trained on the routine maintenance and basic programming of the systems. All training shall take place on-site using the fully installed and certified system.

3.13 WARRANTY-GUARANTEE

- A. The Designer reserves right to reject any part of the installation which does not successfully meet requirements as set out in these specifications.

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- B. This Contractor shall, and hereby does, guarantee all work installed under this Division shall be free from defects in workmanship and materials for a minimum period of one year from date of final acceptance. Additional warranty provisions may be outlined in specific sections. The above parties further agree that they will repair and replace any defective material or workmanship which becomes defective within the terms of this warranty-guarantee.

END OF SECTION

SECTION 27-0526
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 270500 - Common Work Results for Communications.
- B. Refer to electrical drawings for additional details.

1.02 REFERENCES

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2017.
- B. EIA/TIA- 607D Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
- C. ANSI/TIA 568 Commercial Building Telecommunications Cabling Standard including all subsets, addendums and erratas, latest edition
- D. ANSI/TIA-569 Telecommunications Pathways and Spaces
- E. ANSI/TIA-606 Administration Standard for Telecommunications
- F. ANSI/TIA-758 Customer-owned Outside Plant Telecommunications Infrastructure Standard
- G. ANSI/TIA-862 Structured Cabling Infrastructure Standard for Intelligent Building Systems
- H. ANSITIA-942 Telecommunications Infrastructure for Data Centers
- I. ANSI/TIA-1005 Telecommunications Infrastructure Standard for Industrial Premises
- J. ANSI/TIA-1179 Healthcare Facility Telecommunications Infrastructure Standard
- K. ANSI/TIA-4966 Telecommunications Infrastructure Standard for Educational Facilities
- L. BICSI TDMM, latest edition

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Manufacturer's descriptive literature for each system component specified in this section.
- C. Shop drawing showing
 - 1. bonding types and locations.

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2. cable gauge and type

PART 2 - PRODUCTS

2.01 MATERIALS

A. Buss Bars:

1. Manufacturers:

- a. Harger BICSI pattern TMGB kit (#TGBI14420TMGBKT), or individual components.
- b. Harger BICSI pattern TGB kit (#TGBI14220TGBKT), or individual components.
- c. Chatsworth BICSI & ANSI/TIA/EIA Grounding Buss Bars, 20" TMGB (40153-020).
- d. Chatsworth BICSI & ANSI/TIA/EIA Grounding Buss Bars, 12" TGB (13622-012) for small network rooms.
- e. Insure that all ground buss bars are sized to meet minimum EIA/TIA 607 grounding requirements for all equipment in space.

2. Rack-mount Buss Bar

- a. Ortronics Grounding Strip (OR-808004551)
- b. Chatsworth Horizontal Rack Buss Bar, 19" (10610-019)

3. Conductors

- a. Bare copper conductor, stranded
- b. Insulated copper conductor, insulated, green, stranded or solid

B. Exothermic Weld Materials:

1. Manufacturers:

- a. Erico; Cadweld products
- b. Continental Industries; Thermoweld products

C. Connectors:

1. two-lug connectors, UL-listed, irreversible compression
2. single-lug connectors, UL-listed, irreversible compression

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3. exothermic weld connectors, UL-listed
- D. Stand-off Insulators:
 1. Harger
 2. Chatsworth
- E. Other materials as needed to form a complete grounding system.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Telecommunications Ground Busbar (TGB):
 1. Contractors shall position the TGB such that it is protected from physical damage from moving equipment, foot traffic, floor cleaning, etc. Contractors shall install the TGB with stand-off insulators.
 2. The electrical ground conductor shall be extended from an electrical panel ground and connected to the TGB by the Division 26 contractor in accordance with Division 26 specifications.
 3. The Contractor shall prepare all painted or non-conductive surfaces as necessary to achieve a sufficient bond. Star washers may be use to penetrate painted surfaces, if a sufficient bond can be achieved.
 4. The Contractor shall provide and install all necessary grounding hardware to properly ground the equipment in the network room per codes, standards, methodologies, and specifications listed in this document. Self-tapping screws, or any other type of screws, shall not be use to form bonds or attach grounding hardware.
 5. Within each network room, the Contractor shall provide and install an insulated (green), stranded #6 copper ground wire from a network room TGB to each of any:
 - a. Racks
 - b. Ladder rack
 - c. Electrical surge protection
 - d. Shielded cable sheaths
 6. The Contractor shall not bend the grounding conductor wires into tight angles. Changes in direction shall be of the highest radius possible.

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B. Large Telecommunications Enclosures Installations:

1. The Contractor shall install a grounding Buss Bar in any enclosure housing networking or other active equipment. The Contractor may install the Buss Bar at any accessible and reasonable location. The Buss Bar may be a rack-mount Buss Bar attached to rails or a backboard.
2. The Contractor shall prepare all painted or non-conductive surfaces as necessary to achieve a sufficient bond. Star washes may be used to penetrate painted surfaces, if a sufficient bond can be achieved.
3. The Contractor shall provide and install all necessary grounding hardware to properly ground the equipment in the network room per codes, standards, methodologies, and specifications listed in this document. Self-tapping screws, or any other type of screws, shall not be used to form bonds or attach grounding hardware.
4. The Contractor shall connect the enclosure to a TBB with no more than 30 feet of insulated (green), stranded #6 copper ground wire.
5. The Contractor shall not bend the grounding conductor wires into tight angles. Changes in direction shall be of the highest radius possible.

3.02 TESTING:

- A. The Contractor shall test the impedance of all bonds of the grounding system, including cable armor bonding to ground. The impedance of a two-point bonding test across any bond shall not exceed 0.1 ohm. The Contractor shall remediate any bond(s) over this limit or which contribute to a total impedance exceeding 0.1 ohm from any point in the network room to the Buss Bar in that room.
- B. All bonds installed by the contractor shall be tested for impedance with an earth ground resistance test in its two-point setup, such as a LEM Handy GEO tester. Place a QA label (with date and inspector) in proximity to each bond tested.
- C. Test all grounding conductors, once installed, for current. Measure AC and bi-directional DC current. Report any AC current over 1 Amp. Report any DC current, in either direction, over 500 milliamps.

END OF SECTION

SECTION 27-0528.29
HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cable supports.
- B. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

- A. Section 27-0500 - Common Work Results For Communications

1.03 DEFINITIONS

- A. Section 078400 – Firestopping
- B. See Section 27-0500 - Common Work Results For Communications
- C. Section 270526 – Grounding and Bonding for Communications.

1.04 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011.
- C. See Section 01-4219 - Reference Standards.
- D. TIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Product Samples: As required

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. ERICO International Corporation
- B. Arlington
- C. Substitutions: Submit substitution request for approval prior to installation.

2.02 CABLE SLING

- A. Provides proper support of Category 5e, Category 6, fibre optic and innerduct
- B. Adjustable strap
- C. cULus® Listed
- D. Complies with NEC® and TIASM requirements for structured cabling systems
- E. Suitable for air handling spaces (plenum)
- F. Acceptable Manufacturers:
 - 1. nVent Caddy
 - a. Part CAT 425
 - 2. Substitutions: Submit substitution request for approval prior to installation.

2.03 CABLE LOOP

- A. Flexible and non-metallic
- B. UV rating when used outdoors
- C. Loop Size:
 - 1. 2" TL20: 2 inches
 - 2. 2.5" TL25: 2-1/2 inches
 - 3. 5" TL50: 5 inches
- D. Color: White
- E. Material: Plastic
- F. Acceptable Manufacturer
 - 1. Arlington

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2. Substitutions: Submit substitution request for approval prior to installation.

2.04 OPEN-TOP CABLE SUPPORT (J-SUPPORT)

- A. Prefabricated, zinc coated, carbon steel designed specifically for telecommunication cable installations.
- B. Open top, 90 degree rolled edges and 1-5/8 to 4 inch minimum diameter loop as per load and growth requirements.
- C. UL listed and spaced at 4 to 5 foot intervals.
- D. Provide beam clamps, rod fasteners, flange clips and brackets as job conditions require.
- E. Acceptable Manufacturers:
 1. Cooper B-Line
 2. Erico
 3. Panduit.
 4. nVent Caddy
 5. Accepted Substitute in accordance with Section 012500 – Substitution Procedures.

2.05 CABLE TIE

- A. Plenum rated when used in plenum environment. Hook and loop only.
- B. Hook and loop type cable tie that easily reopens for moves, adds and changes.
- C. Acceptable Manufacturers:
 1. Hubbell.
 2. Leviton.
 3. Ortronics.
 4. Panduit.
 5. Pass & Seymour.
 6. Simon.
 7. Retyz Releasable Cable Ties

8. Accepted Substitute in accordance with Section 012500 – Substitution Procedures~

2.06 ANCHORS AND FASTENERS:

- A. Obtain permission from Architect before using powder-actuated anchors.
- B. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
- C. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
- D. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
- E. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
- F. Solid Masonry Walls: Use expansion anchors or preset inserts.
- G. Sheet Metal: Use sheet metal screws.
- H. Wood Elements: Use wood screws.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The Contractor shall install cable supports above concealed ceilings using a rigid support to a structural element or by attaching directly to a structural element.
- B. Maintain following clearances from possible sources of electromagnetic interference (EMI) exceeding 5 kVA:
 1. Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway: 6 inch.
 2. Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway: 12 inch.
 3. Unshielded power lines or electrical equipment in proximity to open or nonmetal pathways: 24 inch.
 4. Electrical motors and transformers: 47 inch.
- C. Install hangers and supports as required to adequately and securely support low voltage system components, in a neat and workmanlike manner, as specified in NECA 1.

HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS 27-0528.29 -5

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1. Do not fasten support to ceiling grid or ceiling grid supports, pipes, ducts, mechanical equipment, or conduit.
 2. Obtain permission from Architect before drilling or cutting structural members.
- D. The Contractor may install J-hook or sling-type supports by attaching with suspended ceiling grid-type with manufacturer clamps, provided:
1. The wire is painted orange prior to installation, to differentiate it from ceiling grid support wires.
 2. The wire is not attached to the ceiling grid, as required by the NEC.
 3. The wire is not used to support the ceiling grid, as required by the NEC, and
 4. The local authority having jurisdiction understands they are not supports for the ceiling grid.
- E. Supports shall be installed with a minimum clearance of six inches (6") above an acoustical drop ceiling and shall be placed in such a manner as to prevent cables from resting on any piping or mechanical systems.
- F. Load supports as recommended by manufacturer.
- G. The Contractor shall support Category 5e cables with 5e designated J-hook type or sling-type supports in concealed ceiling spaces.
- H. The Contractor shall support Category 6 cables with sling-type supports and not with J-hooks if supporting more than eight cables.
- I. J-hook and sling-type supports must be installed every 4-5 feet at an irregular interval. Installation of supports at a repeating interval (i.e. every 4 feet exactly) may establish a standing wave induction of interference on the cable. Attaching support to alternating sides of structural steel can accomplish this as can a non-linear installation.
- J. Support design shall allow for a visible sag in the cable. No cable shall be pulled tight.
- K. Supports shall be sized at minimum 2-inch diameter. Limit number of 4-pair cables per bundle of fifty per support.
- L. Separate different media type per support. Treat each type of media separately when determining support fill limits. Multiple tiers of supports may be installed.
- M. Use independent telecommunication-dedicated support rods, wires, and fasteners, no attachment to other systems acceptable.
- N. Cable ties and other methods of binding cabling shall not be installed in such a fashion to as to bend, crimp or deform the cabling in any way so as to alter the electrical or transmission characteristics of the cabling.

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- O. The Contractor shall "close" J-hook support with manufacturer provided bars and not with cable ties. The Contractor shall not use cable ties to strap cable to J-hook supports. The Contractor shall not install cables under such strain as to require tying to supports.

- P. Supporting Device
 - 1. Provide steel angles, channels and other materials necessary for proper support of wall-mounted cabinets, racks, panels, etc.
 - 2. Cabinets, large pull boxes, and cable support boxes: Secure to ceiling and floor slab and not from conduits.
 - 3. Small equipment boxes may be supported on walls.
 - 4. Racks for support of conduit and heavy equipment: Secure to building construction by substantial structural supports.

END OF SECTION

SECTION 27-0553
IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Label Communications Systems as detailed in this section.

1.02 RELATED REQUIREMENTS

- A. Section 27-0500 - Common Work Results For Communications

1.03 REFERENCE STANDARDS

- A. TIA/EIA 568B
- B. BICSI TDMM latest edition
- C. EIA 606

PART 2 - PRODUCTS

2.01 PRODUCT INFORMATION

- A. All labels must be printed. Hand written labels are not permitted.

PART 3 - EXECUTION

3.01 LABELING REQUIREMENTS

- A. All horizontal cables shall be numbered at the jack and patch panel or 110-type termination hardware. Cables shall be identified with a self-adhesive label in accordance with TIA/EIA 606. At the jack, the label shall be placed on a section of the cable, behind the faceplate, that is accessible when the faceplate is removed. At the patch panel or 110-type terminating hardware, each cable should be clearly labeled at a location that can be viewed without removing bundle support ties.
- B. Cables installed for wireless applications must be labeled on both ends to be in compliance with the National Electrical Code, Article 800.2 and 800.52(B).
- C. Contractor shall submit a proposed labeling scheme with the initial submittal package. Labeling scheme must be coordinated with the Owner.

END OF SECTION

SECTION 27-1000
STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Comply with provisions of Section 27-0500 - Common Work Results For Communications.
- B. Supply and install a complete and certified Structured Cabling System consisting of, but not limited to the following components:
 - 1. Multi-mode 50/125 micron fiber optic backbone cable.
 - 2. Single-mode 8.3/125 micron fiber optic backbone cable.
 - 3. Category 3, Plenum rated or ARMM, intra-building backbone cable.
 - 4. Horizontal Unshielded Twisted Pair (UTP) cable: Category 6A for data applications and Category 6A for wireless data applications.
 - 5. Fiber and copper termination hardware.
 - 6. Modular Patch Panels.
 - 7. Connectors and faceplates.
 - 8. Patch cords and cross-connects.
 - 9. Equipment racks and cable management.
 - 10. Cable supports.

1.02 RELATED REQUIREMENTS

- A. Comply with the following sections
 - 1. Section 26-0533.13 - Conduit for Electrical Systems
 - 2. Section 26-0536 - Cable Trays for Electrical Systems
 - 3. Section 26-0533.16 - Boxes for Electrical Systems
 - 4. Section 26-0529 - Hangers and Supports for Electrical Systems
 - 5. Section 26-0526 - Grounding and Bonding for Electrical Systems
 - 6. Section 27-4151 - CATV/SATV Distribution Systems

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011
- B. TIA/EIA 568B
- C. BICSI TDMM latest edition

1.04 SUBMITTALS

A. Pre-Construction Submittals

1. These submittals must be provided 30 days prior to start of construction.
2. Manufacturer product data sheets for each material and equipment specified. Mark each sheet to clearly identify the specific products and component parts, and data applicable to installation.
3. Individual functional systems including, but not limited to, structured cabling, nurse call, video surveillance and access control, where applicable, are required to be submitted as complete packages, inclusive of all major material components. Submittal packages which are not inclusive of complete system components will be rejected.
4. Contractor shall submit faceplate sample to General Contractor for coordination with Electrical device cover plates for color and texture. Approval must be obtained before purchasing and installing face plates.
5. Shop Drawings
 - a. Detailed dimensional plan views of communication equipment rooms showing equipment racks, cable supports and termination hardware for Copper and Fiber.
 - b. Assurance/Quality Control Submittals:
 - 1) Proposed test forms for copper riser and horizontal UTP cable.
 - 2) Documentation of manufacturer's qualification of contractor as an approved Installer.
 - 3) Documentation to provide certification for a current BICSI RCDD to manage all installations and testing procedures. The RCDD must be an employee of the contractor.
 - 4) Record drawings shall be kept on site. Record drawings shall include marked up floor plans showing outlet locations, type of cable, and cable label identification.

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- c. Additional requirements identified in Section 27-0500 - Common Work Results For Communications.

B. Final Submittals

1. These submittals must be submitted and approved prior to final billing and payment. They should be submitted within thirty days of completion of the project.
2. Certification of level of performance as evidenced by comprehensive test results for fiber riser, copper riser and UTP horizontal cabling as specified in this document. Test results should be provided as hard copies and on electronic media.
3. Record drawings with as-built information and finalized versions of the shop drawings. These submittals shall be on the base plan as provided by the system designer. These submittals shall be four copies in reproducible print form and one in electronic format (AutoCAD or DXF file).
 - a. Plan drawings indicating locations and identification of work area outlets, nodes.
 - b. Telecommunications rooms (IDF), and backbone (riser) cable runs.
 - c. Cross-connect schedules including entrance point, main cross-connects, intermediate cross- connects, and horizontal cross-connects.
 - d. Labeling and administration documentation.
 - e. Manufacturer's system certification supporting the product warranty. Transfer manufacturer's warranties to Owner's Representative in addition to the General System Guarantee. Submit these warranties on each item in list form along with the certification test results. Detail specific parts within equipment that are subject to separate conditional warranty. Warranty proprietary equipment and systems involved in this contract during the guarantee period. Final payment shall not relieve the contractor of these obligations.

1.05 WARRANTIES

- A. The structured cabling system shall be a manufacturer certified, Category 6A, Structured Cabling System with a minimum twenty-five (25) year product warranty.

1.06 SEQUENCE AND SCHEDULING

- A. Submit schedule for installation of equipment and cabling. Indicate delivery, installation, and testing for conformance to specific job completion dates. As a minimum, dates are to be provided for bid award, installation start date, completion of

horizontal cabling, completion of riser cabling, completion of testing and labeling, cutover, completion of the final punch list, and Owner's Representative acceptance.

1.07 PRE-INSTALLATION MEETING

- A. Convene a meeting one-week prior to commencing work of this section. Require attendance of parties directly affecting work of this section.
- B. Agenda:
 - 1. Tour, inspect and discuss building conditions relating to structured cable system.
 - 2. Review required submittals, both completed and yet to be completed.
 - 3. Review drawings and specifications.
 - 4. Approve proposed equipment.
 - 5. Review and finalize construction schedule of structured cable system and verify availability of materials, personnel, equipment and facilities needed to proceed without delay.
 - 6. Review required inspections and testing.
 - 7. Review cable routing and support.

1.08 CONTINUITY OF SERVICES

- A. Take no action that will interfere with, or interrupt, existing building services unless previous arrangements have been made with Owner's Representative. Arrange the work to minimize shutdown time.
- B. Owner's personnel will perform shutdown of operating systems. The contractor shall give three (3) days' advance notice for systems shutdown.
- C. Should services be inadvertently interrupted, immediately furnish labor, including overtime, material and equipment necessary for prompt restoration of interrupted service.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Provide all new, unused, equipment and materials, free of defects. Insure all equipment and materials are clean, free of damage or corrosion and are of the best quality obtainable for the purpose intended.
- B. Provide UL Listed communications equipment and materials. When such listing is not available for a piece of equipment, submit equipment and materials for review and

approval by Architect and Owner's Representative prior to procurement or installation on the non-listed equipment or materials.

2.02 ACCEPTABLE MANUFACTURERS

- A. Copper UTP cable
 - 1. Belden
 - 2. CommScope
 - 3. Systemax
- B. Copper UTP Connecting Hardware:
 - 1. Belden
 - 2. CommScope
 - 3. Systemax
- C. Fiber Optic cable:
 - 1. Belden
 - 2. Corning
 - 3. CommScope
 - 4. Systemax
- D. Fiber Termination:
 - 1. Belden
 - 2. Corning
 - 3. CommScope
 - 4. Systemax
- E. Equipment Rack and Cable Management:
 - 1. Chatsworth
 - 2. Great Lakes
 - 3. Middle Atlantic Products

2.03 COPPER DISTRIBUTION CABLE

- A. All high pair count twisted pair copper distribution cable shall be 24 AWG, ARMM type shielded cable. Utilize plenum rated unshielded cable only where required by plenum ceiling conditions.

2.04 FIBER DISTRIBUTION CABLE

- A. The Contractor shall install the appropriate cable type, plenum or non-plenum, for the given environment. For a mixed environment, the contractor may install plenum cable entirely to simplify the installation.
- B. Cable may be single mode/multimode hybrid cables where both fiber types are in a common outer sheath.
- C. Optical fiber cables shall meet or exceed all applicable national and local building fire code requirements. Fiber cables used in a return air plenum environment shall have an Underwriters Laboratories rating that meets or exceeds the requirements of NFPA 262-1985 and UL(r)-910. (OFCP) and (UL(r)) shall be printed every two (2) feet on the cable jacket. The optical fiber riser cable shall have an Underwriters Laboratories rating that meets or exceeds the requirements of UL(r)-1666 (OFCR) and (UL(r)) shall be printed every two (2) feet on the cable jacket. Riser cable exposed to return air plenum spaces in open cable tray shall be plenum rated.
- D. Multi-mode, 50/125 micron OM3 grade, tight buffered, armored, OFCR or OFCP rated.
- E. 62.5/125 OM1 grade fiber may be utilized only in the case of legacy systems which cannot be supported over 50 micron fiber.
- F. Single-mode, 8.3/125 micron OS2 grade, tight buffered, armored, OFCR or OFCP rated.
- G. Fiber optic cables utilizing below grade / outside pathways shall be Indoor/Outdoor Gel-free Stranded Loose Tube Cable construction.

2.05 HORIZONTAL UTP CABLE

- A. Data Cable
 - 1. Category: 6
 - 2. Cable type: Plenum rated.
 - 3. Color: Confirm with owner.
 - 4. Wireless LAN Cable
 - a. Category: 6a

- b. Cable type: Plenum rated.
 - c. Color: Confirm with owner.
5. Cables Exposed to Moisture
- a. Any UTP cable installed in pathways below grade or exterior to the building shall be a filled or indoor/outdoor type cable, to prevent moisture intrusion. These cables shall have the same performance characteristics and rating of other project UTP cables used for the same application, and must be submitted for approval prior to installation.

2.06 PATCH CORDS

A. Copper Patch Cords

- 1. The Contractor shall provide patch cords of the type/category matching the horizontal cable in the quantity of one pair per faceplate or surface mount box, plus 20 percent. The Contractor shall leave the appropriate number of cords, boxed or bagged, in each network room.
- 2. Provide a mix of patch cord lengths in each communications space to enable a neat and orderly patching arrangement, utilizing the rack mounted horizontal and vertical cable management.
- 3. Optical Fiber Patch Cords
 - a. The Contractor shall provide 2-strand zip cord optical fiber patch cords to activate 50 percent of all fiber data ports, bagged or boxed in each network room. Fiber patch cords shall match the type and optical performance grade of the installed fiber.
 - b. Provide a mix of patch cord lengths in each communications space to enable a neat and orderly patching arrangement, utilizing the rack mounted horizontal and vertical cable management.
 - c. Coordinate exact fiber optic patch cable equipment end connector type with Owner and network equipment vendor.

2.07 COPPER CABLE TERMINATING HARDWARE AND CONNECTORS

A. Copper Distribution Cable

- 1. Copper distribution cable shall be terminated at each end on 110-type wiring blocks equipped with 110-C5 connecting blocks. All 110 type terminating hardware shall match performance specifications of terminated cables.

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2. Copper distribution cable shall be terminated at each end on rack mounted modular patch panels. Provide one RJ-45 modular port per copper pair (two pairs terminated on each 24th RJ-45 port).
3. Extend appropriate pair counts from outside plant protectors to rack mounted patch panels where required by installation condition. Utilize ARMM type shielded cable for extension from protectors to rack mounted patch panels.

B. Horizontal Cable

1. Horizontal cable shall be terminated at the work area on T568B/A RJ-45 Information Outlets in maximum six port configuration single gang faceplate (color), at the workstation. Dust cover/blank shall be installed as needed.
2. Refer to faceplate details in project drawings for proper jack layout.
3. Faceplate shall match architectural colors.
4. In the Telecommunications Room (TR), terminate horizontal cable on 24 or 48 port modular patch panels.
5. Install Horizontal Cable Management for each 2 rows (48 ports) of modular terminations.
6. All UTP connecting hardware shall match the performance specifications as dictated by the installed cable to create a manufacturer certified link.
7. Utilize 630A style wall plates with RJ-45 information outlets for wall telephones.

C. Horizontal Wireless LAN Cable

1. Horizontal cable shall be terminated above ceiling on T568B/A RJ-45 Information Outlets in maximum two port configuration surface mount boxes. Dust cover/blank shall be installed as needed.
2. Refer to faceplate details in project drawings for proper jack layout.
3. Surface mount box shall be Electrical Ivory in color.
4. In the Telecommunications Room (TR), terminate horizontal wireless LAN cable on 24 or 48 port modular patch panels.
5. Install Horizontal Cable Management for each 2 rows (48 ports) of modular terminations.
6. All UTP connecting hardware shall match the performance specifications as dictated by the installed cable to create a manufacturer certified link.

2.08 TELECOMMUNICATIONS ROOM RACKS AND CABLE TRAY

A. 2 POST RACKS AND RACK ACCESSORIES:

1. Chatsworth Universal Rack 7' high 19" Black, part number 48353 - 703
2. Vertical cable management: Chatsworth CCS Combination Cabling Section, part number 30162-703
3. Approved equal

B. 4 POST RACKS AND RACK ACCESSORIES:

1. Chatsworth Megaframe 7' high, 19" 30" deep, part number M1032-70x
2. Approved equal.

C. LADDER TYPE CABLE TRAY

1. Chatsworth Universal Cable Runway, Black, 24", part number 10250-724, or approved equivalent, with associated couplings and supports, shall be installed in the communications rooms as indicated on the construction drawings. Utilize additional equivalent product widths as depicted on the construction drawings. All cable runway shall be securely fastened at all wall terminations at on top of equipment racks.

2.09 CABLE MANAGEMENT

- A. Vertical management shall be provided at either side of all vertical racks.
- B. Install horizontal cable management for each 2 rows (48 ports) of modular terminations.

2.10 CABLE SUPPORTS

- A. All horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.
- B. Supports shall be sized at minimum 2-inch diameter. Limit number of 4-pair cables per bundle of fifty per support.
- C. Separate different media type per support. Treat each type of media separately when determining support fill limits.
- D. Support design shall allow for a visible sag in the cable. No cable shall be pulled tight.
- E. Supports shall be secured to the structural ceiling using manufacturer's recommended supports and appropriate hardware as defined by local code or the authority having jurisdiction (AHJ).

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- F. Supports shall be installed with a minimum clearance of six inches (6") above an acoustical drop ceiling and shall be placed in such a manner as to prevent cables from resting on any piping or mechanical systems.
- G. Multiple tiers of supports may be installed.
- H. Supports shall be Caddy Cat Links J-Hook, Caddy wide base cable support, Arlington "The Loop" or equivalent type.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Pulling tension on communications cable shall not exceed 100 Newtons or 25 foot-pounds, or as otherwise specified by manufacturer specifications .
- B. The contractor shall avoid cable stress from cable twist during installation and tension from suspended cable runs and from tightly cinched cable ties.
- C. Support all communications cable to the structure, independent of other services, with j-supports, conduit and trays.
- D. All horizontal copper UTP cable runs shall be a minimum of fifty feet in length to prevent headend equipment signal interference.
- E. Secure all exposed cable in the Telecom equipment rooms to the fire rated plywood backboards or freestanding frames and routed through wire management hardware. The Contractor shall secure the cables to the wall to prevent horizontal movement of the cable (D-rings are acceptable). The Contractor shall secure the cables to the wall in non-deforming manner to prevent vertical movement of the cable, preferably with a wire mesh grip. All work shall be neat and professionally done.
- F. Place cable in conduit or cable tray provided for this use. Support cable so that no passageways are obstructed and that no doors are prevented from closing. No cable or attachments shall be installed that inhibit access to any steam line, electrical or communications cable or device or mechanical equipment.
- G. When placing cable through floor sleeves or penetrations, the vendor shall patch and seal all holes and gaps around the cable in accordance with floor fire rating.
- H. Each station/backbone cable run shall be placed as an uninterrupted conductor section from origination to termination point.
- I. System inspection shall be provided through pre-construction, in-progress and final inspections by the Owner's Representative. The Owner's Representative or authorized representative or the Contractor may, at his/her discretion, perform tests in addition to those specified in this document if there is any reason to question the condition of the material as furnished and installed.

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- J. After installation is complete, in addition to any other required testing, and at such time as the Owner's Representative directs, the Contractor shall conduct an operational test for approval. The installation shall be demonstrated to be in accordance with the requirements of this specification. Any defects revealed shall be promptly corrected at Contractor's expense and the tests re-conducted. Operational testing is defined for the following circuit types.
1. Station cable
 - a. Color code compliance
 - b. Labeling
 - c. Routing
 - d. Workmanship
 - e. Compliance with EIA/TIA 568B requirements
 2. Backbone cable
 - a. Color code compliance
 - b. Labeling
 - c. Equipment room and distribution closet jumpers
 - d. Grounding/bonding
 - e. Workmanship
 - f. Continuity of termination block layout
 - g. Installation and routing
 3. Fiber optic cable
 - a. Labeling
 - b. Patch panel connections
 - c. Loss measured in dB/km
 - d. Workmanship
 - e. Splice loss
 - f. Connector loss
 - g. Circuit length

3.02 COPPER DISTRIBUTION CABLE

A. Installation

1. Any bend in any cable at any point shall have a radius of not less than ten times the outside diameter of that cable.
2. The cable shall be supported in such a manner that there is only minor visible sag and shall be supported vertically with cable grips as required.
3. The cable shield shall be bonded and grounded at each end utilizing the building telecom grounding system.
4. Testing and Inspection
 - a. All pairs shall be tested end to end for opens, grounds, shorts, transpositions, split pairs and presence of AC current. Any cable pair not passing these tests must be repaired or replaced and retested.
 - b. A minimum of 10% of all riser pairs shall have a measured loss of no greater than 1 dB.
 - c. All terminations shall be verified for color code accuracy.
 - d. Test the continuity of bonds and grounds.

3.03 FIBER DISTRIBUTION CABLE

A. Installation

1. Install in accordance with manufacturer's instructions, including maximum pulling tension and allowable lubricants.
 2. At each end, Contractor shall provide at least 10 feet of cable in a wall mounted service loop just below the cable tray.
- B.** The Contractor shall bond to ground both ends of all armored fiber cables
- C.** MaxCell will be installed in specified ducts as indicated on drawings. All conduits will be equipped with the appropriate MaxCell pathway devices (with pull strings) to maximize the fill ratio and utilization. MaxCell will be provided and installed by Division 27 contractor.
- D.** All optical fiber cables are to be continuous and without splicing, unless otherwise specifically described in project documents.
- E.** Where fiber optic cable passes through vertical riser space or network rooms, secure fiber and / or inner duct to wall vertically every 36 inches. Review fasteners, strain relief and routing with Construction Manager.

- F. All optical fiber cable and pathways shall be clearly identified as housing optical fiber at intervals not greater than fifty feet.

3.04 TESTING AND INSPECTION

- A. The Contractor shall test all optical fiber strands for insertion loss and length. The Contractor shall perform bi-directional OTDR and optical source and meter tests on all optical fiber strands.
- B. The Contractor shall test insertion loss at 850 nm and 1300 nm for multimode cabling using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.
- C. The Contractor shall test insertion loss at 1310 and 1550 for single mode cabling in at least one direction using the Method A.1 (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-7.
- D. The Contractor shall determine and record length using an OTDR, optical length test measurement device or sequential cable measurement markings.
- E. Prior to activation of any network electronics utilizing project fiber, fiber test results must be submitted for review and approval. Fiber test results should also be submitted as a part of the final project documentation package.
- F. The Contractor shall calculate the allowable attenuated loss based on final installed length, attenuation coefficient, and connector loss.
- G. The Contractor shall remediate any strands testing above calculated limit as determined by the designer.
- H. Owner reserves the right to have third party testing to confirm the test results. The Contractor shall remediate, at their expense, any strands exceeding this limit by third party testing.
- I. The Contractor shall provide Owner with printed and electronic forms of all test results. Test results shall be unedited and as presented by the tester software. The Contractor may provide supplemental summaries generated by the Contractor. The Contractor shall provide Fiber performance calculation worksheets and fiber link attenuation records as illustrated in Section 21 (Figures 21.14 and 21.15) of the BICSI Telecommunications Cabling Installation Workbook, Technician, 2nd Edition.

3.05 HORIZONTAL CABLE

- A. Installation
 - 1. All cables installed from the workstation to Telecommunications Room shall be a continuous run.

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2. Quantities of cables per workstation shall be provided as indicated on the construction drawings.
3. All cables shall be installed in accordance with TIA/EIA and manufacturer recommendations. Strict attention shall be paid to maintaining sheath integrity, avoiding cable kinks and sharp bends and proper use of cable ties.
4. Cables with severely kinked or cut jackets shall be required to be replaced.
5. No cable shall exceed 295 feet in length.

B. Termination - Data Cable

1. At the Telecommunications Rooms, cables will be terminated on rack mounted 24 or 48 port RJ45 modular patch panels.
2. At the work area, cables will be terminated on RJ-45 information outlets. Any unused outlets in the faceplate will be covered with dustcover/blanks.
3. Voice cables serving wall-mounted telephones will be terminated on standard 630A style communications faceplates with RJ-45 4 pair outlets.
4. Pair twist will be maintained as close as possible to the point of termination. Untwisting shall not exceed 0.5 inch. The sheath of the cable shall be removed only as far as required to terminate the individual pairs.
5. Install all communications device plates in full contact with the wall surface.
6. Leave 12" of cable slack above ceiling.

C. Termination - Wireless LAN Cable

1. At the Telecommunications Rooms, cables shall be terminated on separate rack mounted 24 or 48 port RJ-45 patch panels.
2. At the device end, the data cables will be terminated on RJ-45 Information outlets, housed in 2 port surface mount boxes. Direct modular plug terminations are strictly prohibited.
3. Pair twist will be maintained as close as possible to the point of termination. Untwisting shall not exceed 0.5 inch. The sheath of the cable shall be removed only as far as required to terminate the individual pairs.
4. The contractor shall leave 25 feet of slack at each Wireless AP device location for final adjustment after installation.

D. Testing and Inspection

STRUCTURED CABLING SYSTEM 27-1000 -15

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1. A link test shall be conducted on each data cable using test equipment approved for "Category 5e/6/6A" testing such as Fluke DSP, Microtest Omni-scanner or equal. Any cable not passing this test shall be repaired or replaced and retested.
2. Printed test results and CD shall be provided for each cable.

3.06 LABELS

- A. Labeling scheme shall be as provided by the Owner.
- B. All labels must be printed. Hand written labels are not permitted.
- C. All horizontal cables shall be numbered at the jack and patch panel. Cables shall be identified with a self-adhesive label in accordance with TIA/EIA 606. At the jack, the label shall be placed on a section of the cable, behind the faceplate, that is accessible when the faceplate is removed. At the patch panel, each cable should be clearly labeled at a location that can be viewed without removing bundle support ties.
- D. Cables installed for wireless applications must be labeled on both ends to be in compliance with the National Electrical Code, Article 800.2 and 800.52(B).

3.07 RELAY RACKS

- A. Provide in all telecom equipment rooms as specified in this document and on the construction drawings.
- B. Vertical and horizontal cable management hardware shall be installed on the racks. Appropriate cable management shall be used to provide support for patch cables. Refer to large-scale room details for hardware placement guidelines.
- C. Racks shall be secured to the floor or wall in such a manner that the rack will remain stable when loaded with communications equipment.
- D. Racks shall be located within the room so as not to block access to any existing equipment or backboard space. The racks shall be located so that there is a minimum 36" access to both the front and rear of the rack.
- E. The racks shall be properly grounded using the communications grounding/bonding system.
- F. Utilize cable tray radius type drops and rack radius drops compatible with tray and rack systems at all horizontal to vertical tray to rack cable transitions for proper cable support.

END OF SECTION

SECTION 27-1100
COMMUNICATIONS EQUIPMENT ROOM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Section 27-1123 - Communications Cabinets, Racks, Frames and Enclosures
- B. Section 27-1119 - Communications Termination Blocks and Patch Panels

1.02 RELATED REQUIREMENTS

- A. Section 27-0500 - Common Work Results For Communications

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011.
- B. TIA/EIA 568B
- C. BICSI TDMM latest edition

PART 2 - PRODUCTS

2.01 PLYWOOD

- A. 3/4" A/C-grade, void-free fire retardant plywood, painted as further specified.

2.02 PAINT

- A. Intumescent:
 - 1. ASTM E84(UL 723) "Surface burning characteristics of building materials" Class "A" rating.
 - 2. ASTM E119(UL 263) "Fire tests of building construction and materials" certified.
 - a. Hy-Tech Flame Guard Additive for interior flat latex paint
 - b. PPG Pittsburgh Paint Firetex
 - c. Benjamin Moore 220 Latex Fire Retardant Coating
 - d. Sherwin Williams Flame Control

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Entrance Facilities:

COMMUNICATIONS EQUIPMENT ROOM 27-1100 -2

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1. OSP cables entering buildings shall adhere to NEC (2011) 800.50 (or its successor) requirements for conduit, if OSP cables need to extend beyond 50 feet or one floor.

B. Network Rooms:

1. Network rooms shall be prepared with respect to power, entry pathways (cable tray, inter-floor sleeves, and building entrance conduits), plywood backboards, and other environmental conditions.
2. Service loops shall be secured to the wall in each location in an unobtrusive manner. Service loops shall not block access to other cables, utilities, or otherwise accessed structures (e.g. shut-off valves, meters, etc.). Service loops shall not rest horizontally on cable trays.
3. The plywood shall be anchored every two feet around the perimeter of the board only (no anchors greater than 6" from an edge) with galvanized or stainless steel anchors.
4. A/C-grade plywood shall be painted gray on both sides and all edges, twice, before mounting. At least one fire retardant product information stamp per 4 x 8 sheet shall be left unpainted.

C. Pathways:

1. The Contractor shall install innerduct to protect unarmored optical fiber intra-building backbone cables.
2. Innerduct containing backbone cabling shall end with two feet of cable tray in network rooms. The innerduct may be shortened as needed to accommodate service loops.
3. Secure the innerducts to the wall of network rooms to prevent horizontal movement of the cable (D-rings are acceptable). Secure the cables to the wall in a non-deforming manner to prevent vertical movement of the cable. Plastic cable ties with screw-mounted (not adhesive-mounted) wall mounts are acceptable in this application.
4. The Contractor shall secure the innerduct to the back of the rack. The Contractor may secure the innerduct outside of the cable tray to facilitate bending the innerduct into the top of the rack. Metal or plastic cable ties with screw-mounted (not adhesive-mounted) wall mounts are acceptable in this application.

END OF SECTION

SECTION 27-1119
COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Terminate communications horizontal cabling in communications rooms as identified on drawings and in specifications with the following components:
 - 1. 110-type termination blocks
 - 2. RJ-45 CAT6 modular patch panels
 - 3. Optical fiber termination panels
 - 4. Comply with all Division 26 specifications applicable to communications systems infrastructure and rough-in requirements.

1.02 RELATED REQUIREMENTS

- A. Section 27-0500 - Common Work Results For Communications

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011.
- B. TIA/EIA 568B
- C. BICSI TDMM latest edition

PART 2 - PRODUCTS

2.01 PRODUCT INFORMATION

- A. All communications material and equipment furnished shall be new, unused, and free of defects. The materials shall be clean and free of damage or corrosion and shall be of the best quality obtainable for the purpose intended.
- B. All communications materials used shall be UL listed with a visible UL label, when required by local codes.

2.02 ACCEPTABLE MANUFACTURERS

- A. Belden
- B. CommScope
- C. Systimax

COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS 27-1119 -2

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2.03 TERMINATION BLOCKS

A. Riser / Feeder Cable Applications:

1. Copper distribution cable shall be terminated at each end on 110-type wiring blocks equipped with 110-C5 connecting blocks. All 110 type terminating hardware shall match performance specifications of terminated cables.
2. Copper distribution cable shall be terminated at each end on rack mounted modular patch panels. Provide one RJ-45 modular port per copper pair (two pairs terminated on each 24th RJ-45 port).
3. Extend appropriate pair counts from outside plant protectors to rack mounted patch panels where required by installation condition. Utilize ARMM type shielded cable for extension from protectors to rack mounted patch panels.

2.04 MODULAR PATCH PANELS

A. Horizontal Cable

1. Horizontal cable shall be terminated at the work area on T568B/A RJ-45 Information Outlets in maximum six port configuration single gang faceplate (color), at the workstation. Dust cover/blank shall be installed as needed.
2. Refer to faceplate details in project drawings for proper jack layout.
3. Faceplate shall be (blank) in color.
4. In the Telecommunications Room (TR), terminate horizontal cable on 24 or 48 port modular patch panels.
5. Install Horizontal Cable Management for each 2 rows (48 ports) of modular terminations.
6. All UTP connecting hardware shall match the performance specifications as dictated by the installed cable to create a manufacturer certified link.
7. Utilize 630A style wall plates with RJ-45 information outlets for wall telephones.

B. Horizontal Wireless LAN Cable

1. Horizontal cable shall be terminated above ceiling on T568B/A RJ-45 Information Outlets in maximum two port configuration surface mount boxes. Dust cover/blank shall be installed as needed.
2. Refer to faceplate details in project drawings for proper jack layout.
3. Surface mount box shall be Electrical Ivory in color.

COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS 27-1119 -3

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4. In the Telecommunications Room (TR), terminate horizontal wireless LAN cable on 24 or 48 port modular patch panels.
5. Install Horizontal Cable Management for each 2 rows (48 ports) of modular terminations.
6. All UTP connecting hardware shall match the performance specifications as dictated by the installed cable to create a manufacturer certified link.

2.05 OPTICAL FIBER PATCH PANELS

A. Optical Fiber Applications:

1. In the Telecommunications Rooms, optical fiber cables will be terminated in 2U Rack-mounted Patch Panels with a smoked Plexiglas cover.
2. Double density optical fiber adapter strips, loaded with 12 LC duplex adapters shall be used for single mode rack terminations.
3. Double density optical fiber adapter strips, loaded with 12 LC duplex adapters shall be used for multimode rack terminations

PART 3 - EXECUTION

3.01 LABELING REQUIREMENTS

- A. Refer to Section 27-0553 - Identification For Communications Systems for labeling requirements.

END OF SECTION

SECTION 27-1123
COMMUNICATIONS CABINETS, RACKS, FRAMES AND ENCLOSURES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 27-0500 - Common Work Results For Communications

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011.
- B. TIA/EIA 568B
- C. BICSI TDMM latest edition
- D. TIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces

PART 2 - PRODUCTS

2.01 2 POST RACKS AND RACK ACCESSORIES:

- A. Chatsworth Standard Rack 7' high 19" Black, part number 66353 - 703
- B. Vertical cable management: Chatsworth CCS Combination Cabling Section, part number 30162-703
- C. Approved equivalent

2.02 4 POST RACKS AND RACK ACCESSORIES:

- A. Chatsworth Megaframe 7' high, 19" 30" deep, Black , part number M1032-70x
- B. Approved equivalent

2.03 LADDER TYPE CABLE TRAY

- A. Chatsworth Universal Cable Runway, Black, 24", part number 10250-724, or approved equivalent, with associated couplings and supports, shall be installed in the communications rooms as indicated on the construction drawings. Utilize additional equivalent product widths as depicted on the construction drawings. All cable runway shall be securely fastened at all wall terminations at on top of equipment racks.
- B. Approved equivalent

2.04 RADIUS TYPE DROPS

- A. Utilize cable tray radius type drops and rack radius drops compatible with tray and rack systems at all horizontal to vertical tray to rack cable transitions for proper cable support.

2.05 HORIZONTAL CABLE MANAGEMENT

- A. Install Horizontal Cable Management for each 2 rows (48 ports) of modular terminations.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The Contractor shall provide and install additional cable tray in network room as shown on the drawings. The Contractor may adjust the cable tray size as appropriate for the total cables installed.
- B. The Contractor shall provide and install hardware to maintain bend radii of cables at changes in direction of the cable tray.
- C. The Contractor shall secure cable tray to permanent building structures.
- D. The Contractor shall cover the bottom 1 foot of any cable tray all-thread support rods with conduit to prevent cable rub damage.
- E. Coordinate exact placement with other trades.
- F. Size supporting devices to withstand cable weight plus 60 percent future fill.
- G. Cut and install per manufacturer's recommendations.
- H. Bond and ground to TMGB/TGB with #6 Grounding Wire. Sections: Bolted together or tied together with Grounding Wire running entire length of cable support system.
- I. Maintain bend radius for fiber optic and copper cables when transitioning to/from cable support system.

END OF SECTION

SECTION 27-1513
COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 27-0500 - Common Work Results For Communications

1.02 DEFINITIONS

- A. See Section 27-0500 - Common Work Results For Communications

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011
- B. TIA/EIA 568B
- C. BICSI TDMM latest edition

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Voice and data locations: Unshielded twisted pair, 4-pair Category 6, plenum rated. Confirm color with owner.
- B. Wireless Access Point Locations: Unshielded twisted pair, 4 pair Category 6, plenum rated. Confirm color with owner.
- C. Any UTP cable utilizing below grade pathways shall be a filled or indoor/outdoor type cable, to prevent moisture intrusion, with the same performance characteristics and rating of other project UTP cables.

2.02 ACCEPTABLE MANUFACTURERS

- A. Belden
- B. CommScope
- C. Systemax

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Replace UTP cables that do not pass test criteria for the appropriate level test.

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- C. Horizontal cables shall not exceed 90 m. The contractor is required to bring to the attention of the designer, prior to installation, any outlet locations within the project where distance may be a concern, due to unexpected installation conditions. The contractor must coordinate with the Division 26 contractor prior to cable installation to identify and optimize horizontal and vertical pathways, as well as sleeve requirements necessary to achieve this 90m goal. Installation to remote locations in excess of 90m may be allowed with pre-approval by the designer and Owner.
- D. Copper Horizontal Cable Lengths:
 - 1. Horizontal cables from the patch panel to the information outlet shall be no longer than 295ft. (90m).
 - 2. Horizontal cables used for patch cords and cross-connect jumpers in the communications closet shall be no more than 16 ft (5m) long.
 - 3. There is a 33ft (10m) allowance for the combined length of patch cords and cables used to connect equipment at the information outlet and communications closet.
 - 4. The combined sum of all the above components shall be no longer than 328ft (100m).
- E. Where copper cables route through vertical riser space or network rooms, secure bundles to wall vertically every 24 inches. Review fasteners, strain relief and routing with Construction Manager.
- F. The Contractor shall not untwist UTP cable pairs more than 0.5 inches when terminating.
- G. The contractor shall make use of raceways built into furniture for open office furnished work areas, when conditions previously described are met.
- H. The Contractor shall not install cable in common cable hangers with speaker cables.
- I. The Contractor shall maintain following clearances from EMI sources:
 - 1. Power Cable: 6 inches.
 - 2. Fluorescent Lights: 12 inches.
 - 3. Transformers: 48 inches.
- J. Do not install cable with more than 25 lbf (110 N) pull force, per ANSI/TIA/EIA and BICSI TDMM practices. Utilize appropriate cable lubricant in sufficient quantity to reduce pulling friction to acceptable levels on; long pulls of multiple cables into single small bore conduit, on conduit runs greater than 100 linear feet with bends of opposing directions, and in conduit runs that exceed 180 degrees of accumulated bends. Use

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tensile rated cords (i.e. fishing line) for difficult or questionable pulls - to judge to go/no-go condition of conduit and pulling setup.

- K. The Contractor shall firestop all openings and penetrations through fire and smoke rated wall and floor assemblies, based on classification of assembly.

END OF SECTION

SECTION 27-1543
COMMUNICATIONS FACEPLATES AND CONNECTORS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 27-0500 - Common Work Results For Communications

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011
- B. TIA/EIA 568B
- C. BICSI TDMM latest edition

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Faceplates:
 - 1. Interface Plate, 6-port maximum, color to match electrical plate color
 - 2. Utilize stainless steel plates in food service areas
 - 3. Utilize weatherproof plates in outdoor applications.
 - 4. Blank Insert, as needed
- B. Surface mount wireless access point interface box.
 - 1. Side entry surface mount box, 2-port, almond in color
- C. RJ45 Connector Modules:
 - 1. Category 6 Modular Jacks, Confirm color with owner for data designated jacks
 - 2. Category 6 Modular Jacks, Confirm color with owner faceplate for voice designated jacks
 - 3. Category 6 Modular Jacks, Confirm color with owner for wireless access points
- D. Fiber Optic Connectors
 - 1. Single mode connectors:
 - a. LC connector, field installable, ceramic tip, average loss 0.2dB
 - b. Consumables and fan out materials as required

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2. Multimode connectors:
 - a. LC connector, field installable, ceramic tip, average loss 0.1dB
 - b. Consumables and fan out materials as required
3. Fiber optic cable, connectors and distribution panels shall be from a single manufacturer to insure compatibility.

2.02 ACCEPTABLE MANUFACTURERS

A. Copper UTP Connecting Hardware:

1. Belden
2. CommScope
3. Systemax

B. Fiber Termination Hardware

1. Belden
2. Corning
3. CommScope
4. Systemax

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The Contractor shall provide 12" of cable slack in in-wall, surface-mounted, and raceway boxes, provided the manufacturer's bend radius is not exceeded. Some of the slack may be pulled back into junction boxes, raceways, cable trays, or concealed ceiling space. Slack beyond the outlet box shall be easily pulled out of the box and shall not be secured with cable ties or otherwise secured beyond the box to prevent this.
- B. The Contractors shall install outlet modules as shown on the project drawings.
- C. The Contractor shall terminate all RJ45 outlets in the T568B pin/pair configuration. All four pairs shall be terminated.
- D. The Contractor shall provide and install blank modules in faceplates, as needed.
- E. The Contractor shall cover all outlet openings with masking tape, if other construction is taking place in the area. Tape shall be applied with sufficient pressure to ensure up

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to 60 days of adhesion. Tape shall not wrap around the edges of faceplate or surface-mount box.

- F. The Contractor shall install all outlets in a neat and professional manner to the satisfaction of Owner.
- G. The Contractor shall install outlets in layouts shown in the attached drawings.
- H. The Contractor shall label outlets as shown on the drawings and specified below or per Owner's Standard Specification.
- I. All information outlets shall be installed per manufacturer instructions to ensure a manufacturer certified link or channel solution.

END OF SECTION

SECTION 27-1619
COMMUNICATIONS PATCH CORDS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 27-0500 - Common Work Results For Communications

1.02 DEFINITIONS

- A. See Section 27-0500 - Common Work Results For Communications

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011
- B. See Section 014219 - Reference Standards.
- C. TIA/EIA 568B

1.04 SYSTEM DESCRIPTION

- A. A single manufacturer copper solution shall be installed for the entire project.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Copper Patch Cords:
 - 1. Cat 6 Modular Cord, Confirm color with owner for data applications
 - 2. Cat 6 Modular Cords, Confirm color with owner for wireless access points
- B. Optical Fiber Patch Cords:
 - 1. Multi-mode patch cords:
 - a. Duplex LC connectors, 50/125 micron, OM3, aqua, 1 meter
 - b. Duplex LC connectors, 50/125 micron, OM3, aqua, 3 meters
 - c. Duplex LC to SC, 50/125 micron, OM3, aqua, 1 meter
 - d. Duplex LC to SC, 50/125 micron, OM3, aqua, 3 meters
 - 2. Single-mode patch cords:
 - a. Duplex LC connectors, single-mode, yellow, 1 meter
 - b. Duplex LC connectors, single-mode, yellow, 3 meters

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- c. Duplex LC to SC, single-mode, yellow, 1 meter
- d. Duplex LC to SC, single-mode, yellow, 3 meters

PART 3 - EXECUTION

3.01 INSTALLATION

A. Copper Patch Cords:

1. The Contractor shall provide patch cords of the type/category matching the horizontal cable in the quantity of one pair per faceplate or surface mount box, plus 20 percent. The Contractor shall leave the appropriate number of cords, boxed or bagged, in each network room.
2. Provide a mix of patch cord lengths in each communications space to enable a neat and orderly patching arrangement, utilizing the rack mounted horizontal and vertical cable management.
3. The Contractor shall leave the appropriate number of cords, boxed or bagged, in each network room.

B. Optical Fiber Patch Cords:

1. The Contractor shall provide 2-strand zip cord optical fiber patch cords to activate 50 percent of all fiber data ports, bagged or boxed in each network room. Fiber patch cords shall match the type and optical performance grade of the installed fiber.
2. Provide a mix of patch cord lengths in each communications space to enable a neat and orderly patching arrangement, utilizing the rack mounted horizontal and vertical cable management.
3. Coordinate exact fiber optic patch cable equipment end connector type with Owner and network equipment vendor.

END OF SECTION

SECTION 27-1710
COPPER INTER-BUILDING BACKBONE CABLE

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Work covered by this Section shall consist of furnishing labor, equipment, supplies, materials, and testing unless otherwise specified, and in performing the following operations recognized as necessary for the installation and termination of multi-pair copper cable as described on the Drawings and/or required by these Specifications.
- B. Contractor shall provide hardware for the grounding and bonding of cable and closures and all associated hardware necessary for the routing and management of communication cable in the vicinity of splices.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011
- B. TIA/EIA 568B
- C. BICSI TDMM latest edition

1.03 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. These Specifications, together with the Drawings accompanying them, are intended to depict the installation requirements necessary to support this Project. Contractor shall furnish materials shown and/or called for on the Drawings but not mentioned in the Specifications, or vice versa, that are necessary for the installation and support of communications cabling, whether or not specifically called for in both. In addition, Contractor shall provide incidental equipment and materials required for the completion of systems included in this contract whether or not specified or shown on the Drawings.

1.04 COORDINATION

- A. Contractor shall coordinate the work specified in this Section with the work in other parts of the Contract document.
- B. Plans in general are diagrammatic. It is the full responsibility of the Contractor to be familiar with the location of equipment involved under the work of other trades to eliminate conflicts between the multipair copper cable installation and the work of other trades.
- C. All questions and issues with regard to coordination shall be directed to the Construction Manager.

1.05 SUBMITTALS

- A. All submittals for substitutions shall be made to the Construction Manager.
- B. The Contractor shall submit a Copper cable pulling plan for all multi-pair copper cables with a pair count of 25 pairs or greater, that includes, but is not limited to, the following:
 - 1. Each cable run and route.
 - 2. Date and duration of the pull.
 - 3. Pulling methodology and equipment setups.
 - 4. Pulling tension calculations for each pull in the run.
 - 5. Safety issues and precautions to be taken.

1.06 STANDARDS FOR MATERIALS

- A. All materials shall conform with the current applicable industry standards including, but not limited to:
 - 1. NEMA (National Electrical Manufacturers' Association)
 - 2. ANSI (American National Standards Institute)
 - 3. ASTM (American Society for Testing and Materials)
 - 4. ICEA (Insulated Cable Engineers Association)
 - 5. IEEE (Institute of Electrical and Electronic Engineers)
 - 6. National Electrical Safety Code
- B. In addition, all Material shall be Underwriters Laboratories Listed unless otherwise indicated.

1.07 SUBSTITUTIONS

- A. Intent of Specifications:
 - 1. Where specified only by reference standards, select any product meeting standards by any manufacturer.
 - 2. Where specified by naming several products or manufacturers, select any product and manufacturer named that meets the specified requirements. Other products and manufacturers will not be considered.
 - 3. Where specified by naming one or more products or manufacturers, but indicating "or equivalent" after specified listing, the specified product is the preferred quality

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standard. The Contractor may submit a request for another product for acceptance.

4. Where specified by naming only one product and manufacturer: There is no option and no substitution will be allowed.
- B. Submit requests for substitutions within 10 days of contract award, or sooner if required to maintain the construction schedule.
 - C. The Contractor must submit sufficient information to show that a proposed substitute is equivalent to the item specified. Acceptance of substitutions is at Owner's discretion: the Owner reserves the right to determine suitability of the substitute product and reject any and all materials submitted for substitution. All substitute products and materials must be approved for substitution by the Owner in writing prior to installation. Products rejected or otherwise judged unsatisfactory by the Owner will not be authorized for use in completing the Work. Any unapproved products discovered as part of the installation will be removed and replaced with Owner-specified and approved products at the Contractor's expense.
 - D. Project Drawings may be based on equipment configuration of a particular manufacturer. If a substitution is approved, the Contractor shall make changes needed to accommodate the substitution at no expense, including work under other divisions.

1.08 QUALITY ASSURANCE

- A. Verification: The Owner will maintain inspection personnel on the job site. It is incumbent upon the Contractor to verify that the installation and material used has been inspected before it is enclosed within building features, or otherwise hidden from view. The Contractor shall bear costs associated with uncovering or exposing installations or features that have not been inspected.
- B. Equipment Qualifications: The Contractor is to use equipment and rigs designed for pulling, placement and termination of multi-pair copper cable; including reel trucks, mechanical mules, sheaves, shoes, anchors etc., and equipment for drilling masonry, installing anchors, etc., to install support and cable management hardware.

PART 2 - PRODUCTS

2.01 CABLE

- A. The cable shall be PE-89 Type 24 AWG filled outside plant cable for direct buried and below grade conduit applications.
- B. The cable shall be ARMM type shielded feeder cable for inside, tunnel and conduit applications not exposed to excessive moisture.

2.02 ELECTRICAL PROTECTION

- A. Building Entrance Terminal (Indoor) - Circa Telecom:
 - 1. Circa 1880ECA1-50 110 in / 110 out with cover and splice chamber Building Entrance terminal or approved equivalent. Provide and install housing capacity as required by location and application.
- B. Protector Modules - Systimax Individual Protector Units.
 - 1. Systimax Product Number 4B1EW, Color: Black, (Standard Service), or equivalent.

2.03 PLC COLOR CODED CABLE TIES

- A. Panduit PIC Color Coded Cable Ties - Panduit Part Number PAN-TY PPC25X5OF.

2.04 SHIELD BOND CONNECTORS

- A. 3M Scotchlok 4460 Series Shield Bond Connectors, or equivalent.

2.05 ENCAPSULANT

- A. 3M High Gel Re-enterable Encapsulant 3M Part Number 4442, or equivalent

2.06 BLOCKING COMPOUND

- A. 3M Haplec Blocking Compound 3M Part Number 4408 or equivalent.

PART 3 - EXECUTION

3.01 CABLE INSTALLATION

- A. The Contractor shall submit the cable pulling plan to the Construction Manager prior to commencement of the operation.
- B. The route of multipair copper cable installation is as described herein or as shown on the Drawings.
- C. When breaking out any multipair copper cable of 50 pairs or greater for splicing or termination, the binder groups shall have PIC color coded cable ties attached to the cable at the point of fanout from super groups for splicing, and at the point of fanout for termination on termination blocks. (Panduit Part Number PAN-TY PPC25X5OF).
- D. The Contractor shall ensure the cables are pulled into the ducts in a manner observing the bend radii and tension restrictions of the cable.
- E. The Contractor shall use appropriate shoes, guides, wheels and lubricants to prevent damage to the cable jacket and sheath during installation.

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- F. Install shield bond connectors to the shields of all cables terminated at the Protector Panels.
- G. The Contractor shall apply an appropriate amount of damming compound over the end of filled copper cables in indoor or dry environments to prevent seepage of cable filling compounds where encapsulant will not be used.
- H. Prior to closure assembly in dry or indoor installations, all exposed cable pairs shall have the filling compound thoroughly cleaned off the cable insulation using appropriate cleaning solvents.
- I. All pairs spliced shall be tested and all splice-related faults cleared prior to sealing the closure assembly.
- J. All multipair copper cable pairs installed shall be tested to TIA/EIA 568B, Category 3 equivalent performance specifications. In addition, provide loop resistance measurements in ohms and dB loss at 1KHz, 8KHz, and 256KHz.

3.02 CABLE AND TERMINATION PANEL LABELING

- A. Label the installed cables in accordance with the Owner's instructions.

END OF SECTION

SECTION 27-1720
INTER-BUILDING FIBER OPTIC CABLE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract including General Conditions of the Contract, other Division 1 Specifications, Division 2 Specifications and other Division 26 Sections apply to this Section.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2011
- B. TIA/EIA 568B
- C. BICSI TDMM latest edition

1.03 SCOPE OF WORK

- A. The extent of the interbuilding Fiber Optic Cabling Installation will include the following as shown on the drawings or as specified herein:
- B. Installation, testing, labeling and documentation of new interbuilding fiber optic communication cable between buildings as specified herein and on the drawings.
- C. The installation environment may include existing telecommunications rooms, existing underground concrete encased duct, existing direct-buried conduit, and existing utility tunnel pathways. The contractor shall not be responsible for the installation of concrete-encased ducts, or utility tunnels, unless otherwise specifically described in project drawings or specifications.
- D. The Contractor shall be responsible for: placement of cable, attachment of cable to support devices within the utility tunnel system and underground structures, placement of innerduct, Foduct, and / or MaxCell, furnishing fiber optic splice closures and performance of splices, installation of termination hardware and enclosures, termination of individual fiber strands, labeling, testing and documentation of the work.
- E. The Contractor shall be responsible for the provision of grounding and bonding materials, duct plugs, and firestopping materials as appropriate. Other incidental hardware and appliances, necessary for the proper performance and operation of the communication cable system, which are consistent with the practices of underground cable installation are to be provided by the contractor at no additional charge to the Owner.

1.04 QUALITY ASSURANCE

- A. Verification: The Owner will maintain inspection personnel on the job site. It is incumbent upon the Contractor to verify that the installation and material used has been inspected before it is enclosed within building features, buried, or otherwise hidden from view. The Contractor shall bear costs associated with uncovering or exposing installations or features that have not been inspected.

1.05 SUBSTITUTIONS

- A. Intent of Specifications:
 - 1. Where specified only by reference standards, select any product meeting standards by any manufacturer.
 - 2. Where specified by naming several products or manufacturers, select any product and manufacturer named that meets the specified requirements. Other products and manufacturers will not be considered.
 - 3. Where specified by naming one or more products or manufacturers, but indicating ‘or equivalent’ after specified listing, the specified product is the preferred quality standard. The Contractor may submit a request for another product for acceptance.
 - 4. Where specified by naming only one product and manufacturer: There is no option and no substitution will be allowed.
- B. Submit requests for substitutions within 10 days of contract award, or sooner if required to maintain the construction schedule.
- C. The Contractor must submit sufficient information to show that a proposed substitute is equivalent to the item specified. Acceptance of substitutions is at Owner’s discretion: the Owner reserves the right to determine suitability of the substitute product and reject any and all materials submitted for substitution. All substitute products and materials must be approved for substitution by the Owner in writing prior to installation. Products rejected or otherwise judged unsatisfactory by the Owner will not be authorized for use in completing the work. Any unapproved products discovered as part of the installation will be removed and replaced with Owner-specified and approved products at the Contractor’s expense.
- D. Project drawings may be based on equipment configuration of a particular manufacturer. If a substitution is approved, the Contractor shall make changes needed to accommodate the substitution at no expense to the Owner, including work under other divisions.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. General: The materials and products specified herein reflect the minimum acceptable standards of fabrication and manufacture. All materials and products supplied by the Contractor and specified herein are to be new, unused, of first quality and in original packaging or shipping containers.

2.02 ACCEPTABLE MANUFACTURERS

- A. Fiber Optic cable:
 - 1. Belden
 - 2. Corning
 - 3. CommScope
 - 4. Systimax
- B. Fiber Termination:
 - 1. Belden
 - 2. Corning
 - 3. CommScope
 - 4. Systimax

2.03 OUTSIDE PLANT FIBER OPTIC CABLE

- A. Indoor / outdoor gel free stranded loose tube riser cable, OFNR rated
- B. Cable may be single mode/multimode hybrid cables where both fiber types are in a common outer sheath.

2.04 FIBER OPTIC CONNECTORS

- A. Single mode connectors:
 - 1. LC connector, field installable, ceramic tip, average loss 0.2dB
 - 2. Consumables and fan out materials as required
- B. Multimode connectors:
 - 1. LC connector, field installable, ceramic tip, average loss 0.1dB
 - 2. Consumables and fan out materials as required

- C. Fiber optic cable, connectors and distribution panels shall be from a single manufacturer to insure compatibility.

2.05 OPTICAL FIBER PATCH PANELS

A. Optical Fiber Applications:

1. In the Telecommunications Rooms, optical fiber cables will be terminated in 2U Rack-mounted Patch Panels with a smoked Plexiglas cover.
2. Double density optical fiber adapter strips, loaded with 12 LC duplex adapters shall be used for single mode rack terminations.
3. Double density optical fiber adapter strips, loaded with 12 LC duplex adapters shall be used for multimode rack terminations
4. Fiber optic cable, connectors and distribution panels shall be from a single manufacturer to insure compatibility.

2.06 FIBER OPTIC CABLE LABELS

A. Manholes, handholes, vaults, outdoor and corrosive indoor environments

1. Panduit MMP Stainless Steel Marker Plates - 0.75 inch x 3.50 inches manufactured in 316 stainless steel. Panduit Part Number MMP35O-C316.
2. Panduit Pan-Steel Stainless Steel Clamps - MLT1S-CP

B. Indoor

1. Panduit PST-FO Rigid vinyl self laminating pre-printed marker tags - 3.5 inch x 2.00 inches

2.07 MAXCELL

- A. MaxCell will be installed in specified ducts as indicated on project drawing and / or specifications. All conduits will be equipped with the appropriate MaxCell pathway devices (with pull strings) to maximize the fill ratio and utilization.
- B. Refer to Maxcell Application Guide. Where MaxCell is required, the contractor shall provide and install the maximum number of packs for the conduit pathway as called out in the application guide, unless otherwise specified in the project drawings.

PART 3 - EXECUTION

3.01 TELECOMMUNICATIONS INSTALLATION

A. General

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1. This Section describes the installation locations for the products and materials, as well as methods and Owner's Standards associated with the Telecommunications Installation portions of the Project. These Specifications, along with the Drawings and other Owner-supplied specifications shall be followed during the course of the installation.
2. The Contractor is instructed to coordinate his efforts with other tradesmen who may be working within the same vicinity to avoid conflict, lost time and potential injury. The Owner will assist in coordination as requested or as required.
3. The Contractor is to install all materials plumb, square and in a workman-like manner.
4. The Contractor is required to supply all necessary tools, equipment, accessories safety equipment, protective clothing, etc., as customary for the craft and necessary for the installation.
5. The Contractor shall comply with all National, State and Local Codes and Standards during the course of installation. Should any portion of these specifications conflict with said codes, the contractor is to cease work on that particular aspect of the project and notify the Owner immediately.

B. Field Conditions

1. Fixed facility locations shown on the drawings are based upon the latest design information available at the time this Specification was prepared. The contractor shall conduct field inspections to determine the actual as-built locations of conduits, manholes, handholes and all other special facilities that affect the installation, prior to commencing the installation in any area.

C. Cleaning

1. All TRs, Underground structures to include utility tunnels, conduit and manhole systems, handholes and related fixtures shall be kept as clean as possible during installation. Labor required for any cleaning work shall be provided by the contractor.
2. TRs and Underground structures to include utility tunnels, conduit and manhole systems, handholes and related fixtures, shall be thoroughly cleaned, flushed out, or blown out before the installation is offered to the Owner for acceptance.
3. Temporary labels, temporary protection and related items shall be removed and the entire installation left in a clean, usable condition.

3.02 FIBER OPTIC INNERDUCT INSTALLATION

- A. Refer to the project drawings as applicable for routing.

B. Duct / Conduit Preparation.

1. All ducts and conduits intended for use as a pathway will be blown out with compressed air or brushed out to remove dirt, water, and other residue prior to cable and innerduct installation.

C. Innerduct Installation

1. The contractor shall install innerducts as identified on project drawings for communication cable installed during this project.
2. Innerducts will be cut to allow approximately 6 inches of excess material to extend beyond the end of the duct.
3. Innerducts are to be contiguous sections end to end. If it is absolutely necessary to splice innerduct together, use aluminum couplers as specified herein.
4. Secure innerduct pull ropes by cutting a slit into the excess duct and wedging the pull rope in the slit. Tie off excess slack around the duct.
5. Install a triplex duct plug into each end of the duct used according to the manufacturer's instructions.
6. Install a simplex duct plug over the cable and secure the plug as instructed by the manufacturer.
7. Install a blank plug in unused innerducts.

3.03 FIBER OPTIC CABLE INSTALLATION

A. General - For cable installation within duct banks: Cable is to be installed in Owner-designated ducts, If, field conditions prohibit the use of the Owner-designated duct, the contractor is to select a duct for use and coordinate his selection prior to cable installation. If multicell duct is available, install one cable in each subduct. If no multicell duct is available, the contractor is to install 3 innerducts into a single duct. Three cables are to be installed within each innerduct. If cable is already installed within a duct without innerduct, new cable is to be pulled into the duct (also without innerduct) along with existing cables, provided that the new cable can be pulled without damage to itself or to other cables already in place.

B. Fusion Splicing of Fiber Optic Cable

1. Where required as part of the installation, the contractor shall perform fusion splices of fiber cable.
2. Prior to sealing spliced cables into a fiber optic splice enclosure, the Contractor shall perform a power meter test on each individual fiber as described in Paragraph 3.04 G.3 herein. The attenuation measurement is to be compared to

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the link loss calculation for the segment in question. Measured attenuation through the splice is not to exceed 0.2 dB. Splices that exceed this level will be broken, respliced and retested by the contractor until the minimum reading is attained.

3. After performing the fusion splice, the splice technician shall examine each splice under a IOOX power microscope. Splices with a 'neck-down" (narrowing) effect, with an oversized bulge at the splice location, or which contain gas bubbles, dirt, or other aberrations shall not be acceptable.
4. The spliced fibers are to be installed within a fiber optic splice tray according to the manufacturer's specifications
5. The fiber optic splice closure will be sealed to be air-tight as specified by the manufacturer. Any encapsulant used shall be approved by Owner before installation. Installation would be only after testing and acceptance. Sealed closures are to be secured to the wall of the structure using appropriate hardware.

C. Installation of Fiber Optic Cable Within the Telecommunications Room

1. Routing of cable and cable slack. Upon entering the TR, the fiber optic cable shall be routed to the termination location as shown on the drawings. At least 15 feet of slack cable shall be coiled maintaining a minimum of 2 times the minimum bend radius. The cable and secured to the TR wall or other specified location using cable ties or brackets. If cable ties are used, they shall be pulled snug, without deforming the jacket of the cable. The end of the cable, exclusive of the coil of slack, shall be routed to the modular fiber shelf mounted within the equipment rack for furcation and termination. Secure the cable to the wall or equipment rack using cable ties.

D. Assembly of TR Equipment Racks

1. Where specified by the project drawings, the contractor shall install terminated fiber optic cable within rack-mounted enclosures.
2. The contractor shall assemble the aluminum equipment rack per the manufacturer's instructions.
3. The completed equipment rack will be affixed to the floor using drop-in anchors and 5/8-inch zinc-plated hex bolts, split and flat washers. Place the rack in of the TR to ensure that it is aligned with existing racks, or such that the "front" mounting holes on the channels of the rack are installed with the long axis 4 feet from the parallel wall, and space allowing, 3 feet from any adjacent wall. This is to ensure at least 36 inches of clearance completely around the rack once termination and electronics are installed in the rack.

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4. The contractor will attach the wall angle assembly to the parallel wall behind the rack using lag bolts. Assemble the channel rack—to-runway mounting plate to the top of the rack. The contractor will cut and install one section of cable runway from the parallel wall behind the rack to the top of the rack. Ends of the cable runway will be cut square, even with the outboard edge of the rack top angle bracket and deburred. Install the end bar to the cable runway section end over the equipment rack. Attach the cable runway to the rack and angle bracket using the J-bolts provided with the kits. Ensure that the rack is plumb and square prior to tightening hardware.
5. The contractor is to touch-up bare metal on the cable runway using matching black enamel paint.
6. The modular fiber shelves shall be assembled per the manufacturer's guidelines and installed within the completed equipment racks.

E. Furcation of Fiber Optic Cable

1. Prior to termination, fiber optic cable strands will be furcated (fanned out) using the specified furcation kits and using the procedure specified by the manufacturer.

F. Termination of Fiber Optic Cable

1. Where specified, the Contractor shall terminate the individual fiber strands with connectors of the type specified according to the manufacturer's specifications.
2. Upon final testing, mated-pair connector attenuation shall not exceed 0.5 dB. Connectors which exceed this level of attenuation shall be cut off and fibers re-terminated by the contractor.
3. Terminated fibers shall be installed within modular fiber shelves mounted within an equipment rack, as specified on the Drawings.

3.04 FIBER OPTIC CABLE TESTING

- A. Scope of Work - Work covered by this paragraph shall consist of furnishing labor, equipment and supplies unless otherwise specified, and in performing the following operations recognized as necessary for the successful testing and verification of the installation of the fiber optic cable plant described on the drawings and required by these specifications. In addition, the Contractor shall:
 1. Verify through Optical Time Dimension Reflectometer (OTDR) testing as well as visual inspection of manufacturers testing results, the quality of the fiber optic cable being installed.
 2. Verify through power meter testing the attenuation of all point to point fiber optic strands.

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3. Verify through OTDR testing the integrity of the point-to-point connections, the final installed connector-to-connector length of the fiber optic strands.
4. Verify through visual inspection of all fiber optic cable termination locations on drawings, the integrity of the workmanship and the operability of the fiber optic media.

B. Contractor Responsibility:

1. The Contractor shall:
 - a. Complete quality control inspection and testing per this specification.
 - b. Maintain fiber optic test technicians qualified to operate the test equipment on the job site during testing.
 - c. Maintain test equipment in current calibration during testing operations.
 - d. Notify the Owner when work, technicians and equipment are prepared for acceptance tests and inspections. Coordinate testing with the Owner beforehand to avoid delays in the project schedule.
 - e. Maintain written record of tests pertinent for each fiber run and upon completion of testing, assemble and certify a final test report.
 - f. Maintain safety procedures and discipline when test equipment is emitting optical energy.

C. Test Equipment

1. Contractor will submit specification sheets for the test equipment to be utilized for Owner approval prior to commencement of testing.
2. Calibration
 - a. The Contractor is to ensure all test instruments are calibrated to provide measurements within stated accuracy.
 - b. Visible, dated calibration labels will be affixed to test instrumentation. Calibration will have been performed within 12 months of current testing operation.
 - c. The Contractor shall be prepared to present accurate records that indicate the calibration history of the equipment. The records should include the date and results of instruments calibrated or tested.
 - d. Test equipment is to be calibrated using a standard of higher accuracy than that of the instrument tested. Accuracy is to be directly traceable to the National Institute of Standards and Technology.

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D. Acceptance Procedures:

1. Purpose: The following acceptance practices will be followed to ensure that should the incorrect products be received, should damage to the cable have occurred during shipping and handling; the Contractor can reorder replacement materials as soon after determination of the product's unsuitability as possible to minimize the impact to the installation schedule.
 - a. The contractor shall visually inspect fiber optic cable reels for damage upon receipt from the shipper.
 - b. Part numbers on cable reel shipping labels, bills of lading, invoices, etc., shall be compared to the original order.
 - c. Cable lengths should be verified.
 - d. The manufacturer's OTDR measurement records received with the shipment shall be examined to ensure compliance with stated attenuation performance. The contractor will either accept and guarantee the OTDR and loss measurements provided with the cable or will make their own test before acceptance. The OTDR readings will be provided for all the fibers in each spool of fiber optic cable. Readings will be taken at the 850 nm, 1300 nm windows for multi mode fiber and 1310 nm, 1550 nm windows for single mode fiber.
 - e. The Contractor will retain the manufacturer's test data and provide it, along with all other specified test documentation to the Owner at the completion of the project.

E. Field Testing Procedures

1. The following test procedures will be performed for all fiber optics cable installations. No variance can be obtained without written request to the Owner explaining the reasons for the request. Verbal approvals will not be accepted or provided.
2. Prior to activation of any network electronics utilizing project fiber, fiber test results must be submitted for review and approval. Fiber test results should also be submitted as a part of the final project documentation package.
3. All readings will be taken end to end in both directions on every fiber terminated at both ends, without exception.
4. Fiber optic cable that is left unterminated at the far end will be tested using a launch cable from the far end to the TR.
5. The Owner is to be notified at least 24 hours prior to testing to allow observation at the Owner's discretion. If the Owner confirms his intention to observe, a

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reasonable starting time will be agreed upon. Should the Owner not be present at the scheduled commencement time, the contractor may begin testing as scheduled.

F. Maximum Acceptable Attenuation Values

FIBER TYPE	TEST WAVELENGTH	MATED PAIR CONNECTOR LOSS (EACH PAIR)
62.5 or 50/125 Multimode	850nm	0.5 dB
62.5 or 50/125 Multimode	1300nm	0.5 dB
Single mode	1310nm	0.5 dB
Single mode	1550nm	0.5 dB
FIBER TYPE	TEST WAVELENGTH	FUSION SPLICE LOSS (EACH)
62.5/125 Multimode	850nm	0.2 dB
62.5/125 Multimode	1300nm	0.2 dB
Single mode	1310	0.2 dB
Single mode	1550	0.2 dB

G. Optical Time Domain Reflectometer (OTDR) Testing

1. After all terminations have been completed, tests will be conducted using an OTDR prior to testing with a power meter set (optical light source and optical meter). Contractor will test insertion loss of 850 nm and 1300 nm for Multimode cable; and at 1310 nm and 1550 nm wavelengths for Single mode cable, for both directions through each connector pair using the OTDR. Use of an OTDR determines overall length and pinpoints loss locations along the segment being tested by indicating their distances from the source. The Contractor will use the OTDR traces to assess the span attenuation that is necessary to evaluate the final acceptance tests utilizing the power meter test set(s). The power meter test measures overall attenuation of each span; this test also determines whether terminations are not within specified quality limits.
2. OTDR Testing and the Span Loss Benchmark Calculation
 - a. Span Loss Benchmark Calculation. The estimated attenuation (loss) must be calculated for each fiber segment to determine a comparison value for the actual readings during the power meter test. This calculation is derived from the original reel tests performed at the time of cable acceptance.
 - b. In general, the OTDR traces must be interpreted to determine the length of each cable segment. Both ends of the span are terminated with an LC connector. In the following example the test is performed on multi mode fiber

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at 850nm. At the conclusion of the test, the trace for the span (end-to-end) is interpreted as follows:

Segment 1 is a fiber segment measured from termination-to-termination.
Distance of Segment 1 (per OTDR trace) = 125 meters
Pre-Installation Attenuation Acceptance Test = 2.90 dB/km
Calculation: 125 meters X 0.0029 dB/meter = 0.36 dB
Calculated loss value for Segment 1: = 0.36 dB
Mated pair connector loss: 0.5 dB (per pair)* X 2 = <u>+1.00 dB</u>
= 1.36 dB
Maximum allowable loss for the span = 1.36 dB
The Span Loss Benchmark Calculation for this span: 1.36 Db
The benchmark calculation for the span is to be compared with the reading taken on the span with the power meter in final acceptance testing.

3. Power Meter Testing

- a. All testing done with a light source and power meter shall be done such that the loss of any cables or connections used to interface the fiber to be tested to the instruments is measured and subtracted from the total loss of the fiber optic circuit. For testing the finished installation, the instrument(s) shall be “front ended” with LC connectors so that the testing includes the interface to the LC bulkheads in the fiber termination panels.
- b. After termination of all the individual fibers, power meter readings will be taken. The attenuation of readings must not be higher than the optimal attenuation loss. The optimal attenuation loss will be calculated using the manufacturer’s factory certified fiber test reports (dB/km) converted to the actual installed lengths plus the attenuation losses for the LC connector of 0.50 dB per mated connector pair. The optimal attenuation losses shall be used for comparison with the end-to-end power loss test results prior to acceptance by the Owner.
- c. If any reading is higher than 0.10 dB over the optimal attenuation loss, the Owner must be contacted for acceptance. If the loss is not acceptable, then the contractor must re-terminated the fiber to obtain acceptable loss levels. This will be done at the Contractor’s expense. Records of fiber loss must be maintained and provided for system acceptance by the Owner.

4. Test Report Submittals

- a. The contractor shall submit a completed Fiber Optic Cable Test Report to the Owner for review prior to the Owners acceptance of the Work.
- b. The Fiber Optic Cable Test Report shall be completed utilizing the format specified by the Owner.

3.05 LABELING

- A. Each Fiber Optic Cable installed by the Contractor shall be labeled as follows:
1. Where not enclosed in conduit, all optical fiber cable pathways, including conduit, innerduct, Foduct, or other subducts, shall be clearly identified by fiber optic cable labels as housing optical fiber at intervals not greater than fifty feet.
 2. Fiber optic cable in cable trays or installed in other interior exposed conditions shall be clearly identified by fiber optic cable labels as housing optical fiber at intervals not greater than fifty feet.
 3. The Fiber Optic Cable shall be labeled utilizing the format specified by the Owner.
 4. Labels are to be attached to the cable jackets with stainless steel straps. Cable ties are acceptable for interior labels. Labels straps will be cinched firmly enough to prevent slippage, but not tight enough to score, cut, or otherwise damage the cable jacket.
 5. Place labels within 12 inches of each termination. Ensure labels are positioned to allow reading without twisting the cable.
 6. Place labels within 12 inches of each splice closure entry indicating the fiber strand count for the entry and exit cables.

END OF SECTION

SECTION 27-5223
NURSE CALL-CODE SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Provide a complete working Nurse/Patient Communications Network based upon the specification outlined here to include all necessary devices that provide the functions listed in this specification. This facility will be referenced as the OWNER in this specification.
 - 1. If an operational function is specified that requires hardware or software to complete that specific function, then consider that software or hardware part of this specification. The cost of any omissions of software or hardware necessary to complete all operational functions outlined in this specification shall be borne by the contractor providing this system.

1.02 SCOPE

- A. This specification is for a complete and new Nurse Call system.

1.03 REFERENCE STANDARDS

- A. Underwriter's Laboratories UL-1069 current release
- B. Canadian Standards Association
- C. National Electrical Code
- D. NFPA 70 and 99
- E. U.S. Dept. of Labor / Occupational Safety and Health Administration
- F. State Hospital Code / Joint Commission of Hospitals - Nurse Call Requirements
- G. NEMA installation standards
- H. European Union's DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003, commonly known as the RoHS Directive

1.04 QUALIFICATIONS

- A. Authorized Distributor for product supplied. Authorized Distributor Letter from manufacturer required upon request of specifying authority.
- B. Applicable state licenses. Copy available upon request.

- C. Certificate of successful completion of manufacturer's installation/training school for installing technicians of the equipment being proposed. Letter from manufacturer stating technician qualifications on request.
- D. Certificate of completion of network certifications (i.e. Cisco or Microsoft). Copy available upon request.

1.05 SUBMITTALS

- A. Manufacturer product data sheets for each material and equipment specified. Mark each sheet to clearly identify the specific products and component parts, and data applicable to installation.
- B. Assurance/Quality Control Submittals:
 - 1. List of all tests to be performed as a part of the certification process
 - 2. Documentation of manufacturer's current qualification of contractor as an approved installer of the proposed system
 - 3. Provide references of a minimum of three completed installations of the proposed system.
 - 4. Provide number of proposed system certified installers. Owner may request a list by name and proof of training.
 - 5. Certificate of insurance - Contractor cannot begin installation of the system or be paid for any material or labor until this document is provided to the General Contractor.
 - 6. Installation work shall not begin prior to approval of all pre-construction submittals.

1.06 SYSTEM DESCRIPTION

- A. System hardware shall consist of local dome lights, call cords, pull cord stations and wiring. All necessary equipment required to meet the intent of these specifications, whether or not enumerated within these specifications, shall be supplied and installed to provide a complete and operating code system.
- B. All wall mounted stations shall be flush mounted using snap tight cover plates. Sub plates shall be slotted and adjustable for trimming the mounting for "squaring" the vertical and horizontal fit. All screws shall be hidden.
- C. All flush mount station buttons shall use a bio-seal cover to facilitate the use of disinfectant cleaners.

1.07 PROJECT SITE VISIT

- A. It is the responsibility of all prospective contractors to make an adequate inspection of the project site. A mandatory site visit will be scheduled. Any contractor not registered as having attended the mandatory site visit tour will be disqualified and any bid proposal will automatically be rejected.

1.08 DEMONSTRATIONS

- A. It will be necessary to utilize demonstration equipment to test the functional operation of the contractor's submitted equipment. Contractor will be notified of any demonstration dates and times. If such demonstrations are utilized, it will be the sole judgment of the OWNER and specifying authority to decide whether a contractor/manufacturer meets or exceeds the specification.
- B. All demonstrated equipment must be of a standard single manufacturer and meet the same required testing and conditions that are applicable to the manufactured equipment. Custom or modified equipment that is not of standard, current manufacture cannot be demonstrated.

1.09 SCHEDULING

- A. Coordinate work with the other trades for scheduling, rough-in, and finishing all work specified. The Owner's Representative will not be liable for any additional costs due to missed dates or poor coordination of the supplying contractor with other trades.

1.10 WARRANTY

- A. The supplying contractor shall provide a warranty on the system which shall include all necessary labor and equipment to maintain the system(s) in full operation for a period of one year from the date of acceptance.
- B. In addition, the equipment (parts) warranty for all core system components including control / switching equipment, power supplies, patient stations, sub-stations, and nurse consoles shall extend to a total of at least five (5) years. Warranty for ancillary devices such as pillow speakers and call cords shall extend to a total of at least two (2) years.
- C. Manufacturer shall provide, free of charge, product firmware upgrades throughout the 1 year warranty period for any product feature fixes.
- D. After the acceptance of the system(s) service shall be provided on the following basis:
 - 1. Emergency Service - Provided 24 hours a day. When a total or catastrophic failure of equipment is reported to contractor, within 2 hours of notification, a service person will be on site. (An example of a catastrophic failure would be a PoE switch or a nurse console failure.)

2. Routine Service - Provided within 4 business hours (9 a.m. to 5 p.m., Monday through Friday, excluding holidays) of notification. When a minor failure of equipment is reported to contractor, a service person will be on site within 24 hours of notification. (An example of a minor failure includes peripheral equipment such as control stations, entertainment speakers, corridor lights, pull-cord stations, etc. which normally affect only one patient or patient room.)

1.11 MAINTENANCE

- A. Provide necessary spare parts after commissioning of system(s) and prior to final payment.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The products specified shall be new and of the standard manufacture of a single reputable manufacturer. Acceptable systems are as follows:
 1. Cornell
 2. Owner approved equal

2.02 SUB-STATIONS

- A. Provide as shown on plans, sub-stations which shall be flush mounted in a single gang box. All sub station cancel buttons will be local on the device
- B. Individual sub-stations shall be:
 1. Pull cord station shall be water resistant with a replaceable PVC pull-cord, and easily cleaned surface. The pull-cord shall have a large, easy to pull plastic "bell" attached.

2.03 CORRIDOR LIGHTS AND CONTROLLERS

- A. Provide as shown on plans, the proper type of local corridor light or controller.

PART 3 - EXECUTION

3.01 SUPERVISION

- A. Only factory certified installers shall install, service and maintain the specified network system.
- B. Manufacturer shall have the equipment manufacturer's engineer or their designated agent inspect the installation and operation of this network to determine that the network complies with all standards listed in Part 1.03.

3.02 TRAINING

- A. Contractor shall provide thorough training of all nursing staff assigned to those nursing units receiving new networked nurse/patient communications equipment. This training shall be developed and implemented to address two different types of staff. Floor nurses/staff shall receive training from their perspective, and likewise, unit secretaries (or any person whose specific responsibilities include answering patient calls and dispatching staff) shall receive operational training from their perspective. A separate training room will be set up that allows this type of individualized training utilizing in-service training unit, prior to cut over of the new system.

3.03 NEEDS ASSESSMENT

- A. Manufacturer shall provide a one-on-one meeting with the particular nursing manager of each unit affected by the installation of the new networked nurse/patient communications equipment. This meeting shall include reviewing the floor plan drawing, educating the nursing manager with the functions of the equipment that is being provided and gathering details specific to the individual units; coverage and priorities of calls; staffing patterns; and other pertinent details that will affect the training. In-service Scheduling materials and sample of training materials will be provided. A staff member list and Pocket Page Tag Message list, if needed, be filled out for inclusion in the software. Information gathered will be provided to Contractor to program the network software.

3.04 WIRING

- A. Contractor shall terminate all wiring with manufacturer approved connectors. The use of wire nuts is prohibited.
- B. All wiring shall be free from shorts and faults. Wiring shall be UL listed, NEC and NFPA 70, Article 25 approved.
- C. Nurse patient communications network wiring shall not be run in the same conduit with other systems (i.e. Class 1 AC power distribution, fire alarm, entertainment systems, lighting controls, etc.).

3.05 ELECTRICAL POWER CONNECTIONS

- A. It shall be the responsibility of the hospital to provide a dedicated 120 VAC, 60 HZ conduit feed into the equipment cabinet. This power feed shall not have any other devices connected directly to it. A 20 AMP circuit breaker located in the electrical sub-panel labeled "nurse call" will control this circuit. This electrical circuit will be connected to the hospital's emergency power system for automatic power switch over during loss of utility power.
 - 1. Large separation between controllers and power supplies should be connected by fiber optic cable to reduce common mode power supply issues.

3.06 ENVIRONMENTAL PROTECTION

- A. Make certain that all network control equipment is accessible for service. Contractor shall notify specifying authority if designated equipment closet does not meet manufacturer's requirements for heat, radiation or static electricity.

3.07 CLEANING AND PATCHING

- A. It shall be the responsibility of the contractor to keep their work area clear of debris and clean area daily at completion of work.
- B. It shall be the responsibility of the contractor to patch and paint any wall or surface that has been disturbed by the execution of this work.

3.08 DRAWINGS

- A. Provide as built drawings of all installed network components and associated wiring on building plans. Final payment for work will not be authorized unless these drawings are supplied.

END OF SECTION

SECTION 28-0500
COMMON WORK RESULTS FOR ELECTRONIC SAFETY & SECURITY

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Basic materials and methods, along with General Requirements of Division 1, applicable to Division 28 sections.
 - 2. Drawings and general provisions of the contract, including General and Supplementary Conditions of Division 1, applicable to Division 28 sections.
- B. Related Sections
 - 1. Section 28 1300 - Access Control System
 - 2. Section 28 4600 - Fire Detection and Alarm System
 - 3. Division 9 - Field Painting

1.02 CONTRACTOR REQUIREMENTS AND QUALITY ASSURANCE

- A. Comply with applicable local, state and federal codes.
- B. Comply with applicable requirements of recognized industry associations which produce standards for the various trades.
- C. Warrant work under this specification against faulty material or Workmanship in accordance with Division 1. If the project is occupied or the systems placed in operation in several phases at the request of Owner's Representative, then the warranty of each system or piece of equipment used shall begin on the date of substantial completion for each phase. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.
- D. Equipment and material provided under this Division shall be periodically inspected and serviced by competent installers. This function becomes the responsibility of the Owner once the system is accepted by the Owner. The one year material and Workmanship warranty is not intended to supersede normal inspection or service and shall not be construed to mean the Contractor shall provide free service for normal maintenance items such as periodic cleaning and adjustment due to normal use, nor to correct without charge, breakage, maladjustment, and other trouble caused by improper maintenance.
- E. Upon completion of contract and progressively as work proceeds, clean-up and remove dirt, debris and scrap materials. Maintain the premises in a neat and clean condition at all times during construction. Protect and preserve access to Head-end

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equipment at all times. Clean items with factory finishes. Touch-up minor damage to surfaces; refinish entire piece of equipment when sustained major damage. All electronics must be protected from dust and other airborne debris.

1.03 STANDARDS

- A. The Contractor's performance of the work shall comply with applicable federal, state and local laws, rules and regulations. The Contractor shall give required notices, shall procure necessary governmental licenses, permits, and inspections and shall pay without burden to Owner's Representative, all fees and charges in connection therewith unless specifically provided otherwise. In the event of violation, the Contractor shall pay all fines and penalties, including attorney's fees and other defense costs and expenses in connection therewith.
- B. Codes, Standards and Ordinances: Design, manufacture, test, and install electronic safety and security systems per manufacturer's requirements and in accordance with state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:

1.04 COMPLETENESS OF WORK

- A. The Contract Documents depict low voltage systems which are intended to be complete and functioning systems. All products, materials, labor, and programming necessary to render a fully functional system to fulfill the design intent shown on the documents shall be provided by the contractor.
- B. Catalog numbers referenced throughout this Division's drawings and specifications are intended to convey a general understanding of the type of quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra charge shall be allowed because a catalog number is found to be incomplete or obsolete.

1.05 OWNER FURNISHED INFORMATION

- A. To the extent the Owner has performed and made available as Owner Furnished Information an Infection Control Risk Assessment (ICRA), the Contractor shall execute all requirements of the Contract Documents in accordance with the ICRA, and shall perform and provide all labor, materials and supervision to execute the specific infection control measures identified therein.
- B. The Contract Documents do not necessarily depict all the work required by the ICRA, nor are the Contract Documents responsible for the information contained in the ICRA. The Contractor shall request, and obtain if available, the Owner's ICRA documentation, become familiar with its requirements and perform all work accordingly.

1.06 SUBMITTALS

- A. Comply with provisions of Division 1.

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- B. Submit shop drawings as called for in the Specification Sections that follow.
- C. Within thirty (30) days after contract has been awarded, Contractor to submit to Designer for review a complete list of materials, equipment, and accessories proposed for use, listing the item and manufacturer's name only.
- D. Based upon aforementioned approved listing, Contractor to submit required number, electronic and/or hard copy, of complete brochures and shop drawings of all materials, fixtures, and equipment that Contractor proposes to use giving the names of manufacturers, trade name and specific catalog numbers.
- E. AutoCAD or Revit files requested by Contractor for use in submittals, coordination drawings, as-builds, etc., will be subject to executing a release document from the Engineer prior to release of electronic media.
- F. Specification Compliance Letter, indicating line by line Comply, Deviation, or Not Applicable annotation.
- G. Product Data Brochures
 - 1. Furnish original color product datasheets, describing the specification and technical requirements of the system and each component. When multiple products are listed, denote by highlighting or other form which product they intent to use.
 - 2. Miscellaneous cut sheets for wire, cable; terminal block connector's etc. clearly identifies model numbers, manufacturer names and miscellaneous engineering data.
 - 3. Provide equipment quantities and model numbers for all equipment being proposed.
 - 4. Provide engineering calculations, such as voltage drop, electrical load calculations, etc. as it relates to devices.
- H. Shop Drawings
 - 1. Provide detailed system drawings, including location and mounting requirements.
 - 2. Complete and legible legends should be provided for each of the drawings.
 - 3. Provide functional block diagrams.
 - 4. Provide mounting details, indicating mounting, protective housings etc.
 - 5. Provide wiring diagrams and point-to-point wiring schematics to panels, indicating utilized inputs and spare inputs.
 - 6. Details of connections to power sources including power supplies.

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7. Console/Rack installation, block diagrams, and wiring diagrams.
 8. Denote main cable pathways or individual home runs.
 9. Locations and cable/installation type where fire rated protection materials/methods are required.
- I. Assurance/Quality Control Submittals
1. Certification letters stating the Contractor is an authorized reseller, installer, and extended warranty provider for the specified systems.
 2. Evidence of technicians qualified for work in the form of specified manufacturer's training certification.

1.07 DELIVERY AND STORAGE

- A. Insofar as possible, deliver items in manufacturers' original unopened packaging. Where this is not practical, cover items with protective materials, to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.
- B. Store items in a clean dry place and protect from damage.

1.08 OPERATING AND MAINTENANCE MANUALS

- A. Comply with the provisions of Division 01.
- B. Prior to final acceptance of the project, furnish to Owner complete bound sets of operation and maintenance manuals of instructions for operation and maintenance of all pieces of equipment and systems provided under this division of specifications.
- C. Manuals shall be in electronic and hard copy, bookmarked by section with searchable PDF's.
- D. Manuals to also include all submittal data on all materials and equipment. Clearly indicate items provided on this project. Included a list giving name and address of nearest supply house which carry the spare parts and name and address and phone number of Installation Contractor to be given to Owner.
- E. The following data are required:
1. Operating and maintenance instructions.
 2. Spare parts lists.
 3. Copies of approved submittal data.
 4. Warranty information including any required test results.

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- F. At completion of work, submit required number of complete sets of data, in the format requested, to the Owner's Representative for distribution to the proper parties.

1.09 RECORD DRAWINGS

- A. Comply with the provisions of Division 01.
- B. Provide updated drawings, denoting all changes to the construction documents and the date at which the change took place.
- C. Provide updated drawings, which illustrate final field conditions; these drawings shall incorporate all changes to the construction documents.
- D. Panel power schedules, denoting circuits dedicated for use.
- E. Wire and cable run sheets including cable identification numbers and terminal strip designations.
- F. Legends which indicate device types, symbols, abbreviations and manufacturer's model numbers.
- G. Functional block diagrams for all subsystems. Schematic diagrams for all custom circuitry and interfaces to work not in contract.
- H. Elevations for equipment and/or riser closets, which show the exact configurations and physical installation of related equipment, interface panels, power supplies, junction boxes and equipment cabinetry.

1.10 WARRANTY

- A. The Contractor shall adhere to the warranty requirement for all installations.
- B. Warrant work under this specification against faulty material or Workmanship in accordance with Division 1 for a period of one (1) year that shall begin after system acceptance by Owner. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, then the warranty of each system or piece of equipment used shall begin on the date of substantial completion for each phase. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.
- C. The Contractor shall submit in the bid documents any additional, contractor-specific warranties or guarantees to be offered on the project.
- D. The Contractor shall provide any and all necessary documentation needed to implement this warranty and to verify the solution installation.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment used in carrying out these specifications are to be new and have UL listing, or listing by other recognized testing laboratory when such listings are available.
- B. Specifications and drawings indicate name, type and catalog numbers of materials and equipment to be used as “standards” shall not be construed as limiting competition. Unless otherwise indicated, Contractor may, at his option, use materials and equipment when, in the judgment of the Owner’s Representative, they are equivalent to that specified. Prior approval of substitutions must be given prior to submittals.

2.02 WALL AND CEILING ACCESS PANELS

- A. Style and type as required for material in which installed.
 - 1. Size: 16" X 16" minimum, as indicated, or as required to allow inspection, service and removal of items served.
 - 2. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.
 - 3. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.
 - 4. Prime painted or rust inhibitive paint finish.
 - 5. UL labeled when in fire-rated construction, 1 1/2 hour rating.
 - 6. Provide in walls, floors, and ceilings to permit access to all equipment and junction boxes.
 - 7. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.
 - 8. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers. 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.

PART 3 EXECUTION

3.01 COORDINATION

- A. Install all systems and equipment in accordance with manufacturer instructions.

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- B. Insofar as it is possible to determine in advance, advise the general contractor to leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should contractor neglect doing this, any cutting and/or patching required is to be done at this contractor's expense. Visit site and be informed of conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work involved.
- C. Carefully coordinate with other divisions to ensure proper power requirements, grounding, fireproofing and interlocking controls between the fire alarm system, nurse call system, and owner furnished systems.
- D. Notify other tradesmen of any deviations or special conditions necessary for the installation of work. Interferences between work of various contractors to be resolved prior to installation. Work installed not in compliance with specifications and drawings and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled without additional cost to Owner.
- E. Intent:
 - 1. These sections of specifications and drawings form a complete set of documents for the electronic safety and security systems for this project. Neither is complete without the other. Any item mentioned in one shall be as binding as though mentioned in both.
 - 2. The following sections form a guide for a complete systems installation. Where an item is reasonably necessary for a complete system but not specifically mentioned, such as pull boxes, fittings, expansion fittings, support hangers, etc. provide same without additional cost to Owner.
 - 3. Device layouts indicated on drawings are diagrammatical only. Exact location of outlets and equipment to be coordinated and governed by project conditions. The Designer reserves the right to make any reasonable changes (approximately 6 feet) in location of junction boxes, or equipment prior to roughing in of such without additional cost to Owner.
- F. Deviations:
 - 1. No deviations from specifications and drawings to be made without full knowledge and consent of Designer.
 - 2. Should Contractor find during progress of work that existing conditions make desirable a modification of the requirements of any particular item, report such item promptly to Designer for his decision and instructions.

3.02 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

- A. Comply with provisions of Division 31.
- B. Under other Divisions, provide trenching, excavation, and backfilling necessary for the performance of Work under this Division. Coordinate all requirements with trades. Failure to properly coordinate this effort resulting in additional trenching, excavation, backfilling, or repairs shall be performed without additional cost to Owner.
- C. Provide sheathing, shoring, dewatering, and cleaning necessary to keep trenches and their grades in proper condition for Work to be carried on.
- D. Trenching and excavation shall be unclassified. No extra will be paid in event that rock is encountered.

3.03 DEMOLITION

- A. Visit the site before submitting a bid to observe existing conditions.
- B. Work in existing buildings shall be scheduled well in advance with the Owner. Work shall be performed at such times and under such conditions as suit the convenience of the Owner. Plan the Work to minimize disruption of normal operations. Notify Owner before any circuit is de-energized in occupied areas.

3.04 CUTTING AND PATCHING

- A. Comply with provisions of Division 01.
- B. Repair or replace routine damage caused by cutting in performance of Work under this Division.
- C. Correct unnecessary damage caused due to installation of electrical Work, brought about through carelessness or lack of coordination.
- D. Holes cut through floor slabs shall be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs between floors shall be properly sealed, fire proofed and water proofed.
- E. Holes cut through walls shall be drilled or cut with tools designed for the purpose. All openings, sleeves and holes in walls that extend to underside of floor above shall be properly sealed and fire proofed.
- F. Repairs shall be performed with materials which match existing materials and be installed in accordance with appropriate sections of these Specifications.
- G. Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.

3.05 FOUNDATIONS AND PADS

- A. Provide concrete foundations and pads for equipment per the requirements Division 03. Locate and size foundations, pads, and anchor bolts as required for equipment in this Division.

3.06 INFECTION CONTROL REQUIREMENTS

- A. Coordinate with the Owner the exact requirements for the infection control measures to be executed and performed during the course of this Project.
- B. Prior to execution, present to the Owner for approval a written execution plan for each infection control measure.
- C. Coordinate infection control measures as needed with all other trades and disciplines.
- D. Provide documentation of infection control measures to the Owner, as required and specified in the ICRA.

3.07 TESTS

- A. On completion of work, installation to be entirely free of damaged materials, software errors, incomplete cable installation including terminations, labeling, and dust. Perform a thorough operation test in the presence of the Owner's Representative. Provide documentation of all test results as outlined in each system's specifications. Include labor, materials and instruments for above tests.
- B. Prior to final observation and acceptance, test and leave in satisfactory operating condition, all systems and equipment including but not limited to the following:
 - 1. Access Control System
 - 2. Fire Alarm System

3.08 INSPECTION FEES AND PERMITS

- A. Obtain and pay for all necessary permits and inspection fees required for electronic safety and security systems installation.

3.09 OBSERVATIONS

- A. When field observation services are a part of the project scope, the Architect office will provide periodic observation of the progress of work specified herein. Purpose of the observation is to ensure compliance of Contractor's work with specifications and drawings. The Architect office may also observe tests required of this Contractor as called for in other sections of specifications.
- B. Specifications and drawings represent work to be done in view of total project requirements. Final location of card readers, cameras, duress buttons, fire alarm

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devices, etc., to eliminate possible conflict with other trades is responsibility of this Contractor. Contractor to provide all supervision required for his personnel to ensure that installation is made in accordance with specifications and drawings and all safety rules and regulations are observed. In event of conflicts of work on project with other trades, Contractor to make every reasonable effort to resolve conflict through meetings and discussions with other parties involved, by preparation of drawings or other appropriate action. Only after this has been done shall Architect assistance be requested through the RFI process.

- C. When Architect is requested to visit the project to aid in resolution of conflicts, or for witnessing tests, they shall be given a minimum of 48 hours notice prior to time their presence is requested at job site.

3.10 TRAINING

- A. Comply with the provisions of Division 01
- B. The supplier or manufacturer shall provide thorough training of all staff assigned to those areas receiving new systems and equipment.
- C. This training shall be developed and implemented to address two different types of staff. The end users will be trained on the features and functions of the systems, and the engineering or maintenance department will be trained on the routine maintenance and basic programming of the systems.
- D. All training will take place on-site using the fully installed and certified system.

END OF SECTION

SECTION 28-1300
ACCESS CONTROL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Access control software and client licenses
2. Access control panels, input/output modules, and card readers
3. Access control power supplies
4. Access control servers and security workstations
5. Network switches for security devices
6. Badging software, printers, and associated peripherals
7. Alarm initiating devices, including: door position switches, request-to-exit sensors, duress buttons, glass breakage sensors, and general alarm points
8. Integration with the video surveillance system
9. Integration with the security intercom system
10. Integration with the emergency phone system
11. Interface to electrified door hardware and operators
12. Interface to elevator controllers

B. Related products provided under another Section:

1. 120V power
2. Conduit, junction boxes, and metallic raceways
3. Door hardware, operators, and pushbuttons
4. Fire alarm system interface relays
5. Electromagnetic door holders

C. Related Sections:

1. Section 28 0533 - Security Network Equipment
2. Section 28 1523 - Security Intercom System

3. Section 28 2300 - Video Surveillance System

1.02 SUBMITTALS

- A. Comply with the submittal procedures of Section 28 0500 - Common Work Results for Electronic Safety & Security Systems.
- B. Submittal requirements:
 - 1. Product Data Brochures
 - 2. Shop Drawings
 - 3. Record Drawings

1.03 SYSTEM DESCRIPTION

- A. General:
 - 1. The intent of this document is to provide all pertinent information to allow the contractor to bid the labor, supervision, tooling, and miscellaneous consumables to provide a complete access control system. It is the responsibility of the contractor to include any and all items required for a complete system if not identified in these specifications or drawings.
- B. Scope of Work:
 - 1. Provide access control software with associated license fees to support the card readers and security devices shown on the project drawings.
 - 2. Provide software integration licenses to integrate the access control software with the specified video management software (refer to Section 28 2300 - Video Surveillance System for additional requirements) to enable automatic camera call-up upon event or alarm.
 - 3. Provide rack-mounted access control server.
 - 4. Provide rack-mounted UPS and KVM console.
 - 5. Provide badging licenses, card printers, ribbons, and associated peripherals for badging workstations shown on project drawings.
 - 6. Provide access control panels with associated power supplies located in the telecommunications rooms. Panels to include controllers, reader modules, and input/output modules to support the devices shown on project drawings.
 - 7. Provide multi-technology card readers as indicated on project drawings. Card readers to accept 125 kHz and 13.56 MHz formats.

8. Provide interface to request-to-exit switch within electrified door hardware for access controlled doors. Provide request-to-exit motion sensor for access controlled doors that do not contain integrated switch.
9. Provide door position switches for access controlled and monitored doors shown on project drawings.
10. Provide plenum rated composite cabling for access controlled doors. Provide plenum rated device cabling for duress buttons and other alarm initiating devices not associated with a card reader.

C. Interface to Fire Alarm System:

1. Coordinate with fire alarm system contractor to automatically drop power from stairwell, elevator vestibule lobby, and other doors within the designated path of egress upon activation of the fire alarm system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General

1. It shall be the Contractor's burden to prove that any manufacturer other than the ones listed for each product meet or exceed that sections requirements, if submitted.

2.02 ACCESS CONTROL SOFTWARE

A. Application: Software that provides monitoring and management of access control panels, card readers, alarms and events, cardholder information, and allows integration with other security subsystems.

B. Access Control Software:

1. General:

- a. Open architecture software platform that supports Microsoft Windows Server 2012 and 2016. Client component supports Microsoft Windows 10 operating systems for workstations.
- b. Supports Active Directory, single sign-on, and capable of running on a Microsoft Windows Workgroup environment.
- c. Capable of being installed in a virtual environment using industry leading standards, such as VMware.
- d. Software is hardware agnostic and supports commercial off-the-shelf servers (COTS) and storage attachments.

2. Interfaces:

- a. Supports an unlimited number of card readers, inputs, and output points.
- b. Supports elevator control.
- c. Supports desktop and browser clients.
- d. Supports IP, serial, and modem communications.
- e. Supports mustering, anti-passback, and guard tour functions.
- f. Supports integration with Owner's HR database for automatic provisioning and revocation of cardholder privileges. Software allows for automated communication in either real time or user configurable timed intervals.
- g. Supports integration with specified video management software (refer to Section 28 2300 - Video Surveillance System for additional requirements).
- h. Supports integration with specified security intercom system (refer to Section 28 1523 - Intercommunication System for additional requirements)

3. Features:

- a. Supports fully customizable dynamic views for displaying system components, devices, and database information. Views display changes to the system in real time.
- b. Supports scalable and editable maps by importing vector and raster files to create complex floor plans that graphically illustrate the security system. Maps contain hyperlinks to other maps to create a hierarchy of interlinked files.
- c. Supports secure database partitioning to allow for multiple independent entities to share a single database.
- d. Supports intrusion zones and alarm/disarm commands through card readers with integrated keypads. Keypad commands can be configured to require valid card read and/or valid PIN to activate command.
- e. Includes badge design software and smart card enrollment functionality.
- f. Capable of operating in an enterprise environment where individual sites contain satellite application servers that communicate to a centralized master server. Remote sites retain full control and administration while the master server allows for centralized monitoring and database synchronization.

C. Manufacturers:

1. Honeywell
 - a. #PW41CESW, “Pro-Watch Corporate” base server license for access control and badging software
 - b. #PW41SWCL, “Pro-Watch Corporate” add-on single-user client software license
 - c. #PW41BADGEL, “Pro-Watch Corporate” add-on single-user badging software license
 - d. #PW41RDRxxx (where “x” represents the model number to support the quantity of readers) add-on license for xx-readers
2. Lenel
 - a. #SWS-PROI, “OnGuard PRO-I” base server license for access control and badging software
 - b. #SWC-ADV, “OnGuard ADV/PRO” add-on single-user client software license
 - c. #SWC-IDPRO, “OnGuard PRO” add-on single-user badging software license
 - d. #PRO-64RUP, “OnGuard PRO” add-on license for 64-readers
3. S2 Security
 - a. #S2-EX100-128, “Enterprise 100” appliance with 128 portal license
 - b. #S2-IDC-128, “Identity Management” badge designer and print station license
4. Software House
 - a. #CC9000-KIT-SQL, “C-CURE 9000” base server license
 - b. #CC9000-Sxx (where “x” represents the selected software model number to support the quantity of readers and cardholders), “C-CURE 9000” add-on license for client and badging software, readers, and credentials

2.03 ACCESS CONTROL SERVERS

- A. Application: Dedicated servers for access control software and associated Microsoft SQL database.
- B. Document the cost of these devices at time of bid due to advancements in technology. Prior to product order, provide upgrades to the latest model as recommended by the access control manufacturers up to the cost of the specified system.
- C. Access Control Server:

1. Processor: 1 x Intel Xeon E5-2640 v4 series
2. Memory: 16GB RAM
3. Hard drive configuration: RAID 1
4. Hard drives: 2 x 1TB 7.2K
5. OS: Windows Server 2012 (or most current version supported by manufacturer)
6. Network adapter: 2 x 1GbE
7. Power supply: Redundant hot swappable power supplies

D. Manufacturers:

1. Dell
 - a. #R430, "PowerEdge" rack mounted server, 1U, 2 x 1TB, RAID 1
2. Or equal

2.04 KVM CONSOLE

A. Application: LCD console with integrated KVM switch in a rack-mount configuration.

B. KVM Console:

1. Display Type: 17" LCD 1280 x 1024, active-matrix color
2. Inputs: Keyboard, touchpad
3. KVM Connections: 16 x keyboard, video, monitor
4. Power: 100-240V auto-switching power supply
5. Size: 1U

C. Manufacturers:

1. APC
 - a. #AP5816, 17" LCD rack console with integrated 16-port KVM switch, 1U
 - b. #AP5822, KVM USB patch cable, 3.0m
2. Or equal

2.05 UNINTERRUPTABLE POWER SUPPLY

A. Application: Provides high density, double-conversion on-line power protection with scalable runtime.

B. UPS:

1. Input Power: 208V
2. Input Power Connections: 1 x NEMA L6-30P
3. Output Power: 208V
4. Output Power Capacity: 4.25 KWatts (5 kVA)
5. Output Power Connections:
 - a. 2 x NEMA L6-20R
 - b. 2 x NEMA L6-30R
6. Battery Capacity: 840 ampere hour
7. Size: 5.1"H x 17"W, 3U
8. Finish: Black

C. Manufacturer:

1. APC
 - a. #SRT5KRMXLT, "Smart UPS" series rack-mounted uninterruptable power supply, 5 kVA, 3U
2. Or equal

2.06 NETWORK SWITCHES

A. Application: Dedicated network switch connectivity for security devices.

B. Fiber Switch:

1. Ethernet Ports: 24 x 1GbE SFP
2. Available PoE Power: N/A
3. Uplink Module: N/A
4. CPU Memory: 1GB
5. Flash Memory: 256MB
6. Performance:
 - a. Switching Capacity: 212Gbps
 - b. Forwarding Performance: 128Mpps

7. Power: 200W, redundant power supply

8. Size: 1U

C. Access Switch:

1. Ethernet Ports: 12 x 1GbE PoE+, 12 x 1GbE PoE-60W

2. Available PoE Power: 480W

3. Uplink Module: 2 x 10GbE SFP

4. Flash Memory: 256MB

5. Performance:

a. Switching Capacity: 212Gbps

b. Forwarding Performance: 128Mpps

6. Power: 715W, redundant power supply

7. Size: 1U

D. Manufacturers:

1. Dell

a. #N3024F, "N3000" series network fiber switch, 24 x SFP, hot-swappable 200W power supply

b. #N3024P, "N3000" series network access switch, 12 x GbE PoE+, 12 x GbE PoE-60W, hot-swappable 715W power supply

2. Or equal

2.07 ACCESS CONTROL PANELS

A. Application: An intelligent controller with integrated battery backup, database, and communication ports that supports multiple card readers.

B. Features:

1. Supports multiple communication channels to which control panels, card readers, and alarm monitoring devices connect.

2. Supports hardware modules used for additional memory and/or future feature enhancements.

3. Supports flash upgrades for firmware updates.

4. On-board memory stores a minimum of 50,000 transactions.
5. Utilizes AES 128-bit data encryption for compliance with HSPD-12 and FIPS201 requirements.
6. Compliant with UL294 requirements.
7. Supports HID proximity, HID iCLASS SE, MIFARE, and DESFire card reader formats.
8. Supports up to 32 access levels per cardholder.
9. Supports redundant backup of configuration data.
10. Utilizes an onboard Ethernet NIC with DHCP support.

C. Manufacturer:

1. Honeywell
 - a. #PW6K1IC, "Intelligent Controller (IC)", control module, 32-interfaces (up to 64 readers)
 - b. #PW6KR1, interface module, 2-readers
 - c. #PW6K1IN, interface module, 16-inputs
 - d. #PW6K1OUT, interface module, 16-outputs
2. Lenel
 - a. #LNL-3300, "Intelligent System Controller (ISC)", 32-interfaces (up to 64 readers)
 - b. #LNL-1320, interface module, 2-readers
 - c. #LNL-1100, interface module, 16-inputs
 - d. #LNL-1200, interface module, 16-outputs
3. S2 Security
 - a. #S2-EP-2500, "Intelligent Controller (IC)", 32-interfaces (up to 64 readers)
 - b. #S2-MR-52, interface module, 2-readers
 - c. #S2-MR-16IN, interface module, 16-inputs
 - d. #S2-MR-16OUT, interface module, 16-outputs
4. Software House

- a. #USTAR008, “iSTAR Ultra”, 8-reader, access control panel and enclosure
- b. #USTAR016, “iSTAR Ultra”, 16-reader, access control panel and enclosure
- c. #USTAR-ACM, “iSTAR Ultra”, interface module, 8-readers
- d. #USTAR-CAN, “iSTAR Ultra” enclosure for interface and “RM” modules
- e. #AS0073-CSI, “RM” input bus module, 8-input configurable supervised inputs
- f. #AS0074-000, “RM” output bus module”, 8-outputs

2.08 ACCESS CONTROL ENCLOSURES

A. Application: Wall-mounted enclosures for security control panels and modules.

B. Enclosures:

1. Type: NEMA Type-1
2. Size: 30”W x 48”L x 6”D
3. Contains perforated back-panel for mounting control panels and modules.
4. Provide finger duct wireways within enclosure to dress security cabling.

C. Manufacturer:

1. Unity
2. Hoffman
3. Or equal

2.09 ACCESS CONTROL POWER SUPPLIES

A. Application: Dedicated power supplies to support the electrified lock hardware and security devices.

B. Power Supplies:

1. Inputs:
 - a. Power Input: 120VAC 60Hz, 7 amp
 - b. Device Inputs: 16 normally open or open collector inputs
2. Outputs:
 - a. Power Output: 12VDC and/or 24VDC outputs
 - 1) P/S 1 - 12VDC @ 5.5 amps, P/S 2 - 12VC @ 5.5 amps

- 2) P/S 1 - 12VDC @ 5.5 amps, P/S 2 - 24VDC @ 5.7 amps
- 3) P/S 1 - 24VDC @ 5.7 amps, P/S 2 - 24VDC @ 5.7 amps
- b. Device Outputs: 16 auxiliary power outputs (outputs rated at 2 amp), thermal and short circuit protection with auto reset
3. Features:
 - a. UL listed fire alarm disconnect for any or all of the 16 inputs
 - b. AC fail supervision
 - c. Low battery and battery presence supervision
- C. Batteries:
 1. Sealed, non-spillable lead acid battery with spaded terminals.
 2. Output: 12VDC 12 ampere hour
- D. Manufacturer:
 1. Altronix
 - a. #MAXIMAL33D, "Maximal" series access power controller, 120VAC to 12/24VDC, 16 PTC outputs
 - b. #BT1212, 12VDC 12AH rechargeable batteries
 2. Or equal

2.10 CARD READERS

- A. Application: Reader capable of supporting 125 kHz low-frequency and 13.56 MHz high-frequency formats.
- B. Card Readers:
 1. Rugged, weatherized polycarbonate enclosure, designed to withstand an operating temperatures of -40° to 150° F (-40° to 65° C).
 2. Utilizes a Wiegand protocol for communication to access control panels.
 3. Utilizes custom site keys for increased security.
 4. Utilizes a multi-color LED and an audible sounder to indicate door status.
 5. Capable of reading the following formats:
 - a. 125 kHz - HID proximity

- b. 13.56 MHz - iCLASS SE (secure identity object)

C. Manufacturer:

1. HID Global

- a. #910P, “multiCLASS SE RP15”, series card reader, mullion mount
- b. #920P, “multiCLASS SE RP40” series card reader, standard wall mount
- c. #921P, “multiCLASS SE RPK40” series card reader with integrated keypad

2. Or equal

2.11 CARDS & CREDENTIALS

- A. Application: Contactless smart card or key to provide versatile interoperability in applications such as access control, network logon security, cashless vending, time and attendance, event management, and biometric identification.

B. Credentials:

1. Card:

- a. 13.56MHz read/write contactless smart card
- b. Capable of direct image and thermal transfer with holograms, ultra-violet fluorescent inks, or other anti-counterfeiting features.

C. Manufacturer:

1. HID Global

- a. #3400, “iCLASS SE” smart card

2. Or equal

2.12 POSITION SWITCHES

- A. Application: Contact switches for use in access controlled and alarm monitored doors to provide door position functionality.

B. Door Position Switches:

- 1. Mounting: Recessed
- 2. Size: 1” diameter
- 3. Loop Type: Normally closed
- 4. Contacts: Single pole double throw

5. Gap Distance: Up to 0.5” in steel door applications

C. Manufacturer:

1. Interlogix

a. #1076, recessed door contact switch, 1” diameter

b. #2507A, surface mount wide gap switch with armored cable

2. Or equal

2.13 REQUEST TO EXIT SENSORS

A. Application: Passive infrared sensors for use in access controlled doors where request-to-exit functionality is not integrated into electrified door hardware.

B. Request-To-Exit Sensor:

1. Power: 12 or 24VDC, 26mA

2. Alarm Output: Two form C relay contacts

3. Relay Latch: Adjustable relay latch time to 60 seconds

4. Timer: Programmable reset (accumulative) or non-reset (counting) modes

C. Manufacturer:

1. Bosch

a. #DS160i, request-to-exit passive infrared sensor, grey

b. #TP160, trim plate for request-to-exit sensor, grey

2. Or equal

2.14 WIRE & CABLE

A. Application: Horizontal security cabling to access controlled doors and alarm initiating devices.

B. Access Control System Cabling:

1. Composite Cabling:

a. Composite cabling for access controlled doors consists of the following within a single PVC jacket:

1) Lock Power: 4C 18 AWG, shielded

- 2) Card Reader: 3TP 22 AWG, overall shielded
 - 3) Door Contact: 2C 22 AWG, shielded
 - 4) Request-to-Exit: 4C 22 AWG, shielded
- b. UL tested and listed as CMP.
 - c. Cable installed indoors to contain a yellow jacket.
2. Device Cabling:
- a. Cabling for duress buttons and other alarm initiating devices not associated with card reader controlled doors will utilize a minimum of 18 AWG stranded conductors. Increase conductor size as required to allow for voltage drop on long runs.
 - b. UL tested and listed as CMP.
 - c. Cable installed indoors to contain a yellow jacket.
- C. Manufacturer:
1. Superior Essex
 - a. #AC-A23-68, access control composite plenum rated cable, yellow
 - b. #2F-C15-44, 2C 18 AWG, shielded, yellow
 - c. #2F-C35-44, 4C 18 AWG, shielded, yellow
 2. Belden
 3. Or equal

PART 3 EXECUTION

3.01 EXAMINATION

- A. Install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and as shown, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
- B. Visit the site and verify that site conditions are in agreement with the design package. Report all changes to the site or conditions that will affect performance of the system to the Owner in a report. The Contractor shall not take any corrective action without written permission from the Owner and Owner.

- C. The Contractor shall perform a field survey, and furnish a report to the Owner as part of the site survey report. The Contractor shall be held responsible for repair costs due to Contractor negligence or abuse of Owner equipment.
- D. Verify that all surfaces and areas are ready to receive work.
- E. Verify field measurements as shown on drawings and as instructed by manufacturer.
- F. Verify that required utilities are available, in proper location, and ready for use.

3.02 INSTALLATION

A. General:

- 1. Install the access control system related equipment as specified by the manufacturer and as shown, provide mounting hardware sized appropriately to secure each device for conditions encountered at the site; connect signal lines and AC power to equipment interfaces.
- 2. Install system in accordance with manufacturer's recommendations. This includes, but is not limited to, the following:
 - a. Wiring with racks shall be routed horizontally and vertically in neatly tied bundles. Point-to-point wiring shall not be used.
 - b. Cable bundles shall cross from one rack to the next at the top, center, or bottom only, leaving sufficient working room within the rack.
 - c. Wiring for shall be tie-wrapped so that all connectors in a bundle can be removed and re-installed without the possibility of cross connecting.
 - d. Where wiring is routed through sheet metal or over frame members, the metal edges shall be covered with flexible grommeting or edge dressing (such as automobile door edge trim).
 - e. Double-sided foam tape shall not be used to secure any terminal boxes, relay bases or circuit boards, etc. All device mounting shall be of a permanent nature.
 - f. All excess length AC cords are to be tie-wrapped out of the way, and new plugs installed.
 - g. All cable shall be in conduit, present a professional appearance, and maintain the aesthetics of the installation area.
 - h. All cable shall be in conduit in exposed areas or in spaces without an accessible ceiling, present a professional appearance, and maintain the aesthetics of the installation area

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- i. Care shall be exercised at all times to protect Owner's property. For example, ladders shall not be placed against wallpapered or finished surfaces, equipment or furnishings; desks or countertops shall not be used in lieu of ladders.
 3. Provide all panel wiring required, including temporary wiring. Install wiring in accordance with NEC and NFPA regulations (as applicable), local building codes and ordinances, and all Owner wiring standards. Contractor shall be responsible for obtaining and adhering to applicable regulations, codes, ordinances, and standards. Label conductors at each end with legible, write-on type, self-laminating vinyl labels.
 4. Ensure that:
 - a. All applicable statutes, ordinances, regulations, license requirements and codes are fully complied with.
 - b. All required permits are obtained.
 - c. All required inspections are conducted.
 - d. All necessary certificates are issues, obtained, and delivered to the Owner.
 - e. All equipment installations and mounting are in strict accordance with requirements for applicable seismic classification.
- B. Access Control Software:
 1. Coordinate with Owner's Security representatives to set the following criteria:
 - a. Access card levels and door groupings
 - b. Priority levels for alarm and events
 - c. Schedules and time zones
 - d. Holidays and holiday types
 - e. Actions and responses from individual alarm points
 - f. Routing of alarm points to operator's workstations
 - g. Custom reporting options
 2. <CONFIRM IF REQUIRED> Integrate the access control software with the specified video management software to enable the following features:

- a. Automatic camera call-up upon event (i.e. door forced alarm, door held open too long, etc.) within the access control software to provide a single-user interfaced for responding to alarms.
 - b. View live and recorded video within the access control software.
 - c. Control PTZ cameras.
 - d. Time synchronization of events within the access control and video management software.
3. Incorporate building floor plans from architectural documents to develop dynamic maps complete with device icons and applicable text within the access control software.
- a. Edit CAD or BIM drawing files so that non-applicable layers are removed so that the floor plans can be viewed in a simple manner.
 - b. Convert drawing files to a graphic format that is compatible with access control system software.
 - c. Utilize device icons on each graphical floor plan to indicate card readers, cameras, duress buttons, and other alarm points. Each icon to provide real time status of associated device with command and control functionality.
- C. Access Control Panels:
1. Install access control panels and power supplies in the telecommunications rooms as indicated on project drawings.
 2. Install resistors at device end of line (EOL) per manufacturer's instructions to provide four-state EOL supervision of devices and cabling.
- D. Access Controlled Doors:
1. Card Readers:
 - a. Connect horizontal security cabling to card reader pig tail to enable the following functions:
 - 1) Displays red LED when door is locked and is in secure position.
 - 2) Displays green LED when door is unlocked.
 - 3) Produces audible tone to indicate valid and invalid reads.
 - b. Utilize mounting plate to install card reader onto electrical back-box. Install plumb and square so that there are no obvious gaps between the wall surface and card reader.

2. Electrified Locks:

- a. Terminate cabling from electrified door hardware onto designated output points of lock power supplies so that relays within the access control panels are thermally protected.
- b. <CONFIRM IF REQUIRED> Utilize UL listed disconnect switch on lock power supplies so that access controlled doors within the path of egress can automatically drop power upon activation of fire alarm system.

3. Door Position Switches:

- a. Install recessed door contacts 6” from leading edge of door, unless otherwise noted.

4. Request-to-Exit Sensors:

- a. Connect to electrified door hardware’s “RX” trigger wire for request-to-exit functionality. Install passive infrared request-to-exit motion sensors for doors that do not contain RX functionality within electrified door hardware.
- b. Install motion sensor on protected side of door. Ensure that detection beam is not obstructed by exit signs, fixtures, or other objects.
- c. Adjust relay times and sensitivity on each door so that it properly detects valid exits and eliminates false alarms.

E. <CONFIRM IF REQUIRED> Duress Buttons:

1. Install duress buttons under counter space. Ensure that duress button is not obstructed by shelving, PC holders, or other equipment.
2. Coordinate with furniture and/or millwork contractor to field determine exact location of device prior to installation.

F. Enclosure Penetrations:

1. All enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and all penetrations on exterior enclosures shall be sealed with rubber silicone sealant to preclude the entry of water. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer and in such a manner that the cable is not damaged.

G. Control Line Surge Protection:

1. Cables and conductors, except fiber optic cables, which serve as communication, control, or signal lines shall be protected against surges and shall have surge protection installed at each end.
2. Protection shall be provided at the equipment and additional triple electrode gas surge protectors rated for the application on each wire line circuit shall be installed within three (3) feet of the building cable entrance.
3. Fuses shall not be used for surge suppression.

3.03 LABELING

A. General:

1. The Contractor shall generate all labeling (no labels will be furnished by the Owner) for access control system components. Components include, but are not limited to, the following:
 - a. Control panels, equipment enclosures, and power supplies
 - b. Conduits designated for security
 - c. Card readers and security devices
 - d. Wires and cables
 - e. Terminal blocks and relays
2. Labels shall coincide with identifications used on contractor generated as-built drawings.
3. Labels utilized shall be of sufficient size and have an adhesive backing for permanent attachment.

B. Device Labeling:

1. Coordinate with Owner's Security representative for device label format.
2. Labeling of security devices shall match labeling of device icons within access control system software.

C. Cable Labeling:

1. Utilize permanent machine-generated labels for security cabling with applicable font and text size so that it can be easily legible.
2. Position labels so that they are visible without the need to remove obstructions such as wire management or other materials.
3. Label security cabling at both ends (device and control panel).

3.04 TESTING

A. General:

1. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The Owner will witness all performance verification. Written permission shall be obtained from the Owner before proceeding with the next phase of testing. Original copies of all data produced during performance verification shall be turned over to the Owner at the conclusion of each phase of testing prior to Owner approval of the test.
2. Coordinate testing requirements with the General Contractor and provide specific information on pre-acceptance and final acceptance testing activities so that they can be entered into the overall construction schedule.

B. Cable Testing:

1. All cables and termination hardware shall be 100% tested for defects in the installation and the materials used in order to verify performance under installed conditions. All conductors of each installed cable and system component shall be verified usable by the contractor.
2. All cables shall be tested in accordance with this document, and the best industry standard practices. If any of these are in conflict, the Contractor shall be responsible to bring any discrepancies to the attention of the designer for clarification and/or resolution.
 - a. All cables shall be tested for acceptable signal strength and passage.
 - b. All test results shall be well documented and the documentation given to the designer for proper distribution.
3. The access control cabling system shall be tested by using an approved using an approved test unit capable of performing the required tests.

C. Pre-Acceptance Testing:

1. The Contractor shall perform a 100% pre-acceptance test to verify operation of the access control system prior to the final acceptance test with the Owner.
2. Pre-Acceptance Testing activities shall not occur until Contractor has ensured that all punch list items have been remedied. If conditions exist that may cause degradation or interference with any security device, the Contractor shall inform the Owner.
3. The pre-acceptance testing shall, as a minimum, include:

- a. Verification that any signal or control cabling have been installed, tested, and approved as specified.
 - b. Verification that electrified door hardware functions properly on access controlled doors. Coordinate testing with door hardware contractor.
 - c. Verification that card readers, position switches, and request-to-exit sensors have been properly installed to provide: valid card reads, invalid card reads, door forced open, and door propped alarms.
 - d. Verification that access control software has been properly programmed per the Owner's instructions and configured to integrate third-party databases.
 - e. Verify integration with specified video surveillance system for automatic camera call-up on alarm with proper alarm/event recording parameters.
4. Document the results of the pre-acceptance testing using approved test forms. Report shall indicate the system has been properly calibrated, tested, and is ready to begin final acceptance testing with the Owner.

D. Acceptance Testing

1. Upon successful completion of Pre-Acceptance Testing, the Contractor shall demonstrate to the Owner that the completed access control system complies with the contractor requirements. Acceptance Testing shall not commence until receipt of approved Pre-Acceptance Testing activities based on the Contractor's written report.
2. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown.
3. The Owner may terminate Acceptance Testing at any time when the system fails to perform as specified. Upon termination of testing by the Owner or by the Contractor, the Contractor shall submit a report outlining the required repairs to the Owner then commence system repairs upon direction by the Owner. Upon successful completion of the Acceptance Testing, the Contractor shall deliver test reports and other documentation as specified to the Owner.

3.05 TRAINING

- A. Training shall be supplied as part of the Contractors work. Specifically, an authorized individual familiar with the access control system and related subsystems as specified herein shall conduct the training.
- B. Training shall provide information regarding the operation of the systems, diagnostics, as well as any other aspects required to provide a knowledge base to manage the access control system.

- C. <CONFIRM TRAINING REQUIREMENTS> The Contractor shall coordinate four (4) separate training sessions at least two (2) weeks prior to system turnover for a class no more than eight (8) people. Classes shall be coordinated to include all shifts for all operators. If required, classes will be split up to accommodate the Owner.
1. Session 1:
 - a. A half-day session oriented towards familiarizing operators with basic commands of the access control client software.
 2. Session 2:
 - a. An all-day session detailing system administration that shall include, but not limited to, replacing system diagnostics, changing panel configurations, creating new access levels and time zones, adding/deleting cardholders, troubleshooting, as well as any other item necessary to manage the access control system.
 3. Session 3:
 - a. Performed one week prior to system turnover and shall be an all-day session that shall cover system administration and basic operator training as described in Sessions 1 and 2.
 4. Session 4
 - a. The last and final training session shall be an all-day session that shall recap all administration, basic operator commands and shall be completed post-occupancy at a time coordinated with the Owner. This session shall cover both administration and basic operator commands and also allows the Owner to comment on the performance of the system.

END OF SECTION

SECTION 28-2100
VIDEO SURVEILLANCE SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Network video cameras:
 - a. Panoramic cameras: single sensor, multi-sensor, and multi-directional
 - 2. Mounts, housings, and accessories
 - 3. Surge protection devices
- B. Related Sections:
 - 1. Section 27 15 13: Communications Horizontal Copper Cabling
 - 2. Section 28 23 00: Video Management System

1.02 SUBMITTALS

- A. Comply with the submittal procedures of Section 28 05 00: Common Work Results for Electronic Safety and Security Systems.
- B. Submittal requirements:
 - 1. Product Data Brochures
 - 2. Shop Drawings
 - 3. Record Drawings

1.03 SYSTEM DESCRIPTION

- A. General:
 - 1. The intent of this document is to provide all pertinent information to allow the contractor to bid the labor, supervision, tooling, and miscellaneous consumables to provide a complete video surveillance system. It is the responsibility of the contractor to include any and all items required for a complete system if not identified in these specifications or drawings.
- B. Overview:
 - 1. Cameras will be served by Owner provided network switches in the TDRs and utilize the Owner's LAN for connectivity to network video recording. Refer to

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Section 28 23 00: Video Management System for software and network recording parameters.

2. Cabling for the network cameras will be provided by under Section 27 15 13: Communications Horizontal Copper Cabling.

C. Scope of Work:

1. Provide 270-degree panoramic multi-sensor cameras on the exterior of the building.
2. Provide network fixed and 360-degree single-sensor panoramic cameras as shown on project drawings in interior spaces. Cameras installed within interior ceilings to contain a recessed ceiling housing,
3. Provide camera surge protectors for exterior cameras. Include suppression and grounding equipment to protect head-end devices as required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. It shall be the Contractor's burden to prove that any manufacturer other than the ones listed for each product meet or exceed that sections requirements, if submitted.
- B. Manufacturers:
 1. Axis Communications
 2. Avigilon
 3. Or equal

2.02 NETWORK CAMERAS

- A. Description:

2.03 CAMERA SURGE PROTECTION DEVICES

- A. Application: Protects circuits and devices that use PoE connections.
- B. Features:
 1. Protects power, video, and data on network-based security cameras.
 2. Supports GbE without signal degradation.
 3. Compliant with IEEE 802.3af and 802.3at for PoE and High PoE
- C. General:

1. Connectors: RJ45 connection with external grounding screw
 2. Data rate: Gigabit Ethernet
 3. Max Continuous Current: 1.5 Amps
 4. Dissipation: 3,000 W
 5. Protection Mode: Line-Ground
- D. Manufacturers:
1. Ditek
 - a. #DTK-MRJPOE, surge protection device for PoE devices
 2. Or equal

PART 3 EXECUTION

3.01 EXAMINATION

- A. Install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and as shown, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
- B. Visit the site and verify that site conditions are in agreement with the design package. Report all changes to the site or conditions that will affect performance of the system to the Owner in a report. The Contractor shall not take any corrective action without written permission from the Owner and Owner.
- C. The Contractor shall perform a field survey and furnish a report to the Owner as part of the site survey report. The Contractor shall be held responsible for repair costs due to Contractor negligence or abuse of Owner equipment.
- D. Verify that all surfaces and areas are ready to receive work.
- E. Verify field measurements as shown on drawings and as instructed by manufacturer.
- F. Verify that required utilities are available, in proper location, and ready for use.

3.02 INSTALLATION

- A. General:
 1. Install the video surveillance cameras and related equipment as specified by the manufacturer and as shown. Provide mounting hardware sized appropriately to secure each device for conditions encountered at the site.

B. Network Cameras:

1. Provide flush ceiling mount kit for fixed network cameras within interior accessible ceiling space. Install camera body above ceiling line so only lower polycarbonate dome and trim ring is exposed.
2. Provide outdoor rated housings and mounts for exterior cameras.
3. Prior to installation, coordinate with electrical contractor to confirm exact placement of cameras for conduit and rough-in requirements.
4. Field determine exact placement of cameras installed in interior accessible ceiling to ensure complete coverage of targeted area.
5. Adjust the wide dynamic range, gain control, and noise reduction settings on each camera as required to provide clear and crisp video images.

C. Camera Surge Protection:

1. Connect incoming horizontal UTP cabling in the IN connector. Connect the camera's UTP patch cable to the OUT connector to be protected.
2. Use common ground per device to eliminate the possibility of a differential in ground potentials.

3.03 TESTING

A. General:

1. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The Owner will witness all performance verification. Written permission shall be obtained from the Owner before proceeding with the next phase of testing. Original copies of all data produced during performance verification shall be turned over to the Owner at the conclusion of each phase of testing prior to Owner approval of the test.
2. Coordinate testing requirements with the General Contractor and provide specific information on pre-acceptance and final acceptance testing activities so that they can be entered into the overall construction schedule.

B. Cable Testing:

1. All cables and termination hardware shall be 100% tested for defects in the installation and the materials used in order to verify performance under installed conditions. All conductors of each installed cable and system component shall be verified usable by the contractor.

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2. Testing for the horizontal structured cabling serving the video surveillance system provided by under Section 27 15 13: Communications Horizontal Copper Cabling.

END OF SECTION

SECTION 28-4600
FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Comply with provisions of Section 28-0500 - (DO NOT USE) Common Work Results For Electronic Safety And Security.
- B. Provide labor, materials, equipment and items of service required for completion of a functionally operative fire alarm system as described in subsequent parts of this section.
 - 1. Where building is monitored as part of a campus, provide components and programming as required for integration of new system equipment into existing front end and associated annunciators.
- C. Include in the bid the cost to furnish and install additional devices required by the Authority Having Jurisdiction during the final inspection. Provide this cost as a separate line item with the unit cost for each device. Turn over to Owner devices not installed at the end of the project with a credit for the installation. Include the following device quantities in the cost:
 - 1. Manual pull stations: 5%, but not less than 4
 - 2. Smoke detectors: 10%, but not less than 10
 - 3. Heat detectors: 5%, but not less than 4
 - 4. Duct smoke detectors with remote switches: 5%, but not less than 4
 - 5. A/V devices or visual devices and speakers: 10%, but not less than 20
 - 6. Monitor modules: 5%, but not less than 4
 - 7. Control modules: 5%, but not less than 4
- D. System Integration and Reporting
 - 1. Provide communications connectivity and functionality to support fire alarm system reporting to Integrated Automation System.
 - 2. Reporting shall include each individual alarm, trouble and supervisory signal and report generation.
 - 3. Integrated control functions shall include initiation of walk-test, audible alarm silence. All other control functions retained within fire alarm system, including

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direct interface with door control for door unlock, and lighting control system for 'full-on' operation.

1.02 RELATED SECTIONS

- A. Section 21-3113 - Electric-Drive Centrifugal Fire Pump
- B. Section 21-1313 - Fire Suppression Sprinkler Systems
- C. Section 23-3300 - (DO NOT USE) Air Duct Accessories
- D. Section 23-0923 - (DO NOT USE) Direct-Digital Control System for HVAC
- E. Section 26-0943 - Network Lighting Controls - Lutron QS/Quantum
- F. Section 27 32 36 Emergency Phone System
- G. Section 27 53 23 Public Safety Radio Communication System
- H. Division 11: Audio Visual Systems
- I. Division 14: Vertical Transportation
- J. Division 21: Fire Protection System Drawings
- K. Division 22: Plumbing System Drawings
- L. Division 23: Mechanical System Drawings

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code
- B. NFPA 72 - National Fire Alarm and Signaling Code
- C. 10 CFR 1191 - Americans with Disabilities Act
- D. NFPA 101 - Life Safety Code
- E. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems

1.04 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections. Required items are listed separately for clarity, but system shall be submitted in a single, comprehensive package for review.
 - 1. Specification Compliance Letter
 - 2. Product data sheets for system components highlighted to indicate the specific products, features or functions required to meet the specification.

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3. Complete conduit and wiring layout, point-to-point wiring diagram and riser diagram. Include location of all devices and FACU.
4. Complete conduit and wiring layout showing the addition and point-to-point wiring diagram showing the point of connection to existing circuits being utilized. Include location of all devices and FACU.
5. System power and battery charts with performance graphs and voltage drop calculations to assure the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards and providing for a minimum of 10% spare capacity in each.
6. Provide voltage drop calculations for signaling circuits.
7. Select audible device tap settings to provide coverage per NFPA 72 guidelines, and Manufacturer's recommendation.
8. Select strobe candela rating to provide coverage per NFPA 72 guidelines, ADA accessibility guidelines, and Manufacturer's recommendation.
9. Proposed testing plan, indicating edition of NFPA 72, Chapter 14 to which testing is to be performed.
10. Proposed Owner Training Syllabus, list of training materials and estimated time durations for each syllabus line item.
11. Proposal for service and maintenance contract, including all labor costs, itemized parts list cost and travel costs.
12. Provide above design information signed and sealed by a Registered Engineer, in the state where project is located, for submission to the local authority having jurisdiction.

1.05 TEMPORARY SYSTEM REQUIREMENTS

- A. Provide temporary fire alarm system coverage for the project area, new and demolition areas, as described herein. Install equipment before construction commences in any area and leave in service until construction is complete or until permanent fire alarm system is in place and operational.
- B. Coordinate with Owner the extension of existing fire alarm system for temporary coverage in renovated areas. In new construction, provide complete system with connection into existing building fire alarm system for reporting purposes.
- C. Provide manual stations, heat detectors or other fire alarm devices for temporary system as required per the listing of the devices and as required by the manufacturer and AHJ.

- D. Remove all fire alarm devices, wiring and raceways at the completion of construction. Heat detectors and other fire alarm devices shall be turned over to the Owner in good condition.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: NICET Level III or IV certified fire alarm technician or registered fire protection engineer, employed by the fire alarm control unit manufacturer, experienced in designing fire alarm systems in the jurisdictional area of the project's AHJ.
- B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the type and complexity specified, and of providing maintenance services as a regular part of their business.
 - 1. Installer shall be an authorized installer of the system manufacturer.
 - 2. Installer personnel: Minimum 3 years experience installing fire alarm systems.
 - 3. Supervisor: NICET level III or IV certified fire alarm technician.
 - 4. Contract Maintenance office located within 50 miles of project site.
 - 5. Licensed as a fire alarm installer in the state in which the project is located.

1.07 WARRANTY

- A. Refer to Division 1 for additional warranty requirements.
- B. Provide manufacturer's warranty for all control panels, annunciators, devices to be free from defects for a period of 1 year after date of Substantial Completion.
- C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

1.08 SYSTEM DESCRIPTION

- A. Provide a complete, non-coded, addressable, intelligent, microprocessor-based, reporting fire alarm system as indicated on the drawings and as specified herein, including but not limited to the following:
 - 1. Initiation devices
 - 2. Notification appliances
 - 3. Emergency voice/alarm communications equipment
 - 4. Monitoring and control devices
 - 5. Annunciators

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- B. Provide control panel with a resident, non-volatile, programmable operating system with the following:
1. Program with logic and supervision for closed loop initiating device circuits, individual alarm appliance circuits and operating power, both A.C. and standby power.
 2. Capability of storing and downloading a second set of operating software resident in the control panel as backup in case the primary operating software is corrupted while the system is operating.
 3. Capability of on-site programming to accommodate system expansion and facilitate changes in operation.
 4. Instructions stored in memory that will not be erased upon loss of primary and secondary power.
- C. Provide Fire Alarm Control Unit (FACU) with the following functions:
1. Alarms and trouble conditions that display immediately on the alphanumeric, liquid crystal display indicating the floor level, smoke compartment and device.
 2. A system alarm, red LED that flashes until alarm is acknowledged, after which it remains illuminated steadily until system is reset, unless another alarm is received. The alarm LED will flash again and a new description will appear on the liquid crystal display upon receipt of another alarm.
 3. A pulsing tone that sounds upon arrival of each alarm, until acknowledged.
 4. The ability to scroll through the alarms and troubles existing in the system on the LCD display.
 5. An "alarm list" key that displays, in sequence, all possible alarm, trouble and supervisory service control functions.
 6. A priority sequence for signals with fire alarm events having the highest priority. Subsequent alarm events will be queued in order received and will not affect existing alarm conditions. Second, third and fourth level priorities will be given to supervisory and trouble events respectively. Signals of higher priority take precedence over signals of lower priority even though the lower priority condition occurred first. Regardless of priority or order received, all events will be annunciated.
 7. A means to recall alarms and trouble conditions in chronological order for the purpose of creating an event history. Provide a separate alarm and trouble log with the capacity to store a minimum 300 alarms and 300 trouble events.

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8. A system printer that records all alarm, supervisory, and trouble events including type of signal, the device identification, date and time of occurrence.
 9. An alarm silence button that, upon acknowledgement of an alarm, silences the audible alarm signals while the visual alarm signals remains operating until the alarm is cleared. Upon receipt of a new alarm event, the system initiates the audible alarm signal again.
- D. A system reset button that returns the system to its normal state after the system verifies all circuits or devices are restored to avoid the potential for re-arming the system. Display message "Alarm Present, System Reset Aborted." if system device is not restored.
- E. Provide FACU and system with smoke detector sensor self-checking, compensating and trouble indicating capabilities as follows:
1. Individually monitor smoke detector sensors for calibration, sensitivity, and alarm condition, and to individually adjust for sensitivity.
 2. Determine the condition of each sensor by comparing the sensor value to the stored values.
 3. Maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
 4. Photoelectric smoke sensors with seven selectable sensitivity levels ranging from 0.2% to 3.7% programmed and monitored from the FACU.
 5. Printable sensor reports that meet NFPA 72 calibrated test method requirements that can be utilized for annual recording and logging of the calibration maintenance schedule.
 6. Continuous automatic self-test on each sensor that checks sensor electronics and ensures the accuracy of the values being transmitted. Upon test failure of any sensor, indicate a "Self Test Abnormal" trouble condition.
 7. Automatic indication when an individual sensor needs cleaning with three progressive levels of reporting as the sensor's average value reaches predetermined values. The progressive levels that will be reached if sensors are left unattended and corresponding system reactions are:
 - a. First level: indicates an "Almost Dirty" state without creating a trouble on the system.
 - b. Second level: indicates a "Dirty Sensor" condition that requires attention but that does not affect the sensitivity level required to alarm the sensor, creating a trouble on the system.

- c. Third level: indicate an "Excessively Dirty Sensor" and a trouble condition shall be indicated on the control unit.

1.09 SYSTEM OPERATION

- A. Initiate an alarm condition on the fire alarm system when one or more of the following devices or inputs are activated:
 - 1. Manual pull station
 - 2. Ceiling mounted smoke and heat detectors
 - 3. Duct mounted smoke detectors in the supply and return ducts of air handling units
 - 4. Duct mounted smoke detectors in the supply and return ducts of air handling units and at each damper
 - 5. Sprinkler system water flow switch
- B. Immediately perform the following alarm sequence when an alarm condition is activated on the system:
 - 1. Annunciate on the fire alarm system identifying the floor level, smoke compartment, room number and specific device(s) in alarm. (The room number used for identification shall be the room number assigned by the Owner and not necessarily the room number indicated on the floor plans. Coordinate the device description with the Owner.)
 - 2. Initiate a general fire alarm activating all audio/visual appliances.
 - 3. Signal Remote Monitoring Station (without time delay.)
 - 4. Close doors throughout the facility held open by electric door holders and deactivate all smoke barrier power operated doors.
 - 5. Unlock all egress doors that are electrically locked via a security or other system.
- C. Interface fire alarm system with the HVAC system such that when any device except a manual pull station activates an alarm condition, the following occurs in addition to the actions listed above:
 - 1. Shut down supply and return fans serving the affected smoke compartment.
 - 2. Close smoke dampers in the affected air handling systems.
 - 3. Initiate smoke control sequence in accordance with Division 23.
 - 4. Initiate stair pressurization sequence.

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5. Shutdown systems 2000 cfm and less that serve egress corridors upon alarm in the respective smoke compartment.
- D. Interface fire alarm system with the HVAC system such that when an alarm condition is activated, the following occurs in addition to the actions listed above:
1. Shut down supply and return fans serving the affected smoke compartment.
 2. Close smoke dampers in the affected air handling systems.
 3. Initiate smoke control sequence in accordance with Division 23.
 4. Initiate stair pressurization sequence.
 5. Shutdown systems 2000 cfm and less that serve egress corridors upon alarm in the respective smoke compartment.
- E. Provide a monitor module for each disconnect switch associated with smoke control system fans. Interlock modules with auxiliary contacts of disconnect switches such that a trouble indication is received when disconnect switch is placed in the open position.
- F. Initiate a trouble tone and illuminate an LED light on the FACU to indicate a trouble condition under the following conditions:
1. System wiring short circuit, open circuit or short to ground condition
 2. Failure of audio amplifier
 3. Failure of tone-generating equipment
 4. Failure of primary or secondary power supply
 5. Missing or failed initiating device
- G. Initiate a supervisory tone and illuminate an LED light on the FACU to provide supervision of each distinct device under the following conditions:
1. Activation of a sprinkler valve status switch
 2. Activation of a sprinkler post indicator valve
 3. Activation of a duct mounted smoke detector
- H. Provide supervision and indication for certain non-system equipment on the FACU. Provide necessary relays with dry contacts at the equipment and monitor modules for the following points:
1. Fire pump running

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2. Fire pump loss of phase (loss of power on any phase at the line terminals of the motor contactor)
 3. Fire pump phase reversal
 4. Fire pump controller connected to Alternate Power Source
- I. Provide a dual path Digital Alarm Communicator for point to point signaling to the central monitoring service that an alarm, trouble or supervisory alert condition exists at the facility. Provide equipment with the following:
1. Path 1: hardwired phone connection
 2. Path 2: Selectable IP primary, GSM (Global System Mobile) Cellular secondary
 3. UL listing for fire reporting to a Central Station and meet performance requirements of NFPA 72.
 4. Battery backup.
 5. Supervise wiring from the FACU to the Communicator
- J. Upon initiation of alarms in zone(s) with power operated doors in rated walls, send these doors a signal to disable automatic operation and release any specific locking and hold open function. Coordinate with door hardware schedule and specifications.
1. Exception - roll up doors to be released upon local smoke detection and fusible link only.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Following are approved manufacturers:
1. Johnson Controls/Simplex
- B. Provide equipment and devices used for the expansion of the existing system to match the existing system devices or provide the next generation devices that are compatible with the existing control panel. The existing equipment is manufactured by:
1. Johnson Controls/Simplex

2.02 EQUIPMENT

- A. Fire Alarm Control Unit: Provide FACU with the following functions, components and characteristics:
1. UL 864 compliance.

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2. Microprocessor based Central Processing Unit (CPU) and power supply in a single cabinet.
3. Lockable steel enclosure with a transparent door panel that prevents tampering while giving full view of controls and alarm lights. Provide door that is site configurable for right or left hand hinging. Where multiple cabinets are required to form a complete control unit, provide matching modular unit enclosures.
4. Power supplies: 24VDC output, sufficient to supply 24VDC to all the fire alarm system equipment connected to the system
5. Support for five RS-232-C ports and one service port with each RS-232-C port capable of supporting multiple, remote TFT plasma displays or printers.
6. Include operator controls that are accessible behind the "see through" access door as follows:
 - a. 80 character alphanumeric, LCD display.
 - b. Red system alarm LED, separate yellow supervisory service and trouble LEDs, and a green power on LED.
 - c. Acknowledge Switch that silences the local panel audible alarm when alarm is acknowledged.
 - d. Alarm Silence Switch that silences the general audible alarms throughout the building while keeping the visual alarms active until the system status returns to normal.
 - e. Alarm Activate (Drill) Switch that manually activates all notification appliance circuits.
 - f. System Reset Switch that causes all initiating devices, appliances or software zones, as well as all associated output devices and circuits to return to their normal condition.
 - g. Lamp Test Switch that activates all local system LEDs and light all segments of the liquid crystal display.
 - h. Local City Loop Disconnect Switch that allows testing of the system without sending alarms to the central alarm station.
 - i. An alpha numeric keypad with easy touch rubber keys for field programming.
7. Provide FACU with capacity sufficient to accommodate the system defined by the contract drawings and these specifications. Include necessary provisions in the power supplies, batteries and system capacities for 25% spare capacity of

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monitor/control points and annunciation points without requiring the addition of expansion cards, power supplies, batteries, etc.

8. Emergency Voice/Alarm system: Provide emergency voice/alarm system integral to the FACU with the following:
 - a. Alarm/evacuation signal generation with multiple built in tones.
 - b. Standard or customized digital message storage and message generation.
 - c. Multiple digitally recorded human voice messages.
 - d. Automatic or manual operations of pre-recorded messages as well as a microphone for live messaging from operator.
 - e. Fully supervised NAC speaker circuits that can be manually turned on, off or disabled. Each circuit shall include a custom label to identify its location.
 - f. Local panel speaker for message broadcast verification.

B. Smoke Detectors

1. Photoelectric smoke detectors: intelligent (analog) and addressable, utilizing the photoelectric light-scattering principle to measure smoke density. Furnish with the following:
 - a. LED's that provide dual alarm and power indication. LED's flash green under normal conditions, indicating that the detector is operational and in regular communication with the FACU. LED's produce a steady red light when an alarm condition has been detected.
 - b. Ability to operate a remote alarm LED, an auxiliary relay or an audible base.
 - c. Where called for on drawings, provide detector with an integral, resettable, thermistor-based, 135 degree Fahrenheit fixed-temperature heat detector.
2. Duct mounted smoke detectors: intelligent (analog) and addressable, utilizing the photoelectric light-scattering principle to measure smoke density. Furnish with the following:
 - a. Sampling tubes of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied.
 - b. Air duct housing designed for detection of smoke in HVAC ducts in accordance with NFPA 90. Provide with two test ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test activation of the duct smoke detector.

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- c. A supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A @ 28VDC or 1/2 A @ 120VAC. This auxiliary relay operates when the detector reaches its alarm threshold. Mount relay within 3 feet of the HVAC control circuit.
 - d. LED's that provide dual alarm and power indication. LED's flash green under normal conditions, indicating that the detector is operational and in regular communication with the FACU. LED's produce a steady red light when an alarm condition has been detected.
 - e. A remote test station with an alarm LED and test switch.
 - f. UV stabilized plastic weatherproof duct housing with a NEMA 4X rating for use where detectors are installed on ducts located outside on the roof or otherwise. Housing shall circulate conditioned air from duct to maintain detector housing at rated temperature range. Install duct housing per manufacturer's instructions, providing additional ventilated, sheet metal canopy where the housing is mounted in direct sunlight.
3. Beam smoke detectors: intelligent (analog) and addressable, utilizing a transmitter and receiver to project an infrared beam that is monitored by the receiver to determine smoke obscuration. Furnish with the following:
- a. LED's that provide dual alarm and power indication. LED's flash green under normal conditions, indicating that the detector is operational and in regular communication with the FACU. LED's produce a steady red light when an alarm condition has been detected.
 - b. Coverage of distances up to 300 feet.
 - c. Remote LED status indicator panel with remote test switch for each detector pair.
- C. Heat detectors: intelligent (analog) and addressable, rated for 135 degrees Fahrenheit or 200 degrees Fahrenheit with a rate-of-rise element rated at 15 degrees Fahrenheit per minute. Furnish with the following:
- 1. Automatic reset.
 - 2. Ability to operating a remote alarm LED, an auxiliary relay or an audible base.
 - 3. Utilize 200 degree heat detectors in spaces with high ambient temperatures such as boiler rooms. Provide a remote module located where ambient temperature is lower and within recommended operating range of the addressable module.
- D. Manual Pull Stations: Provide with the following:
- 1. Double action operation.

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2. Red LEXAN or metal finished in red with molded, raised-letter operating instructions of contrasting color. Use metal pull stations where subject to damage.
 3. Station to mechanically latch upon operation and remain so until manually reset with a key common with the control units.
 4. Provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations where called for on drawings. Include a battery powered piercing warning horn to activate when shield is lifted to gain access to the station. Lowering and realigning the shield will silence the horn. Provide horn with 85dB at 10 feet and 9V battery operation.
- E. Addressable Circuit Interface Modules: individually addressable, utilized to monitor and/or control system components that are not otherwise equipped for addressable communication.
1. Monitor modules shall supervise and monitor the status of non-addressable devices with normally open dry contacts. Module shall communicate device status (normal, alarm, trouble) to the FACU.
 2. Control modules shall supervise and control the operation of auxiliary devices. Module shall provide double pole, double throw relay switching for 2 amp @30 VDC resistive power limited and at 1/2 amp @120 VAC resistive, non-power limited. It shall contain easily replaceable 2 amp fuses, one on each common leg of the relay.
 3. Modules to be capable of mounting in a standard electric outlet box with cover plates to allow surface or flush mounting.
 4. Modules shall receive their operating power from the signaling line or a separate two wire pair running from an appropriate power supply as required.
 5. All circuit interface modules shall be supervised and uniquely identified by the control panel. Modules shall have an on board LED to provide indication that the module is powered and communicating with the FACU.
- F. Alarm Notification Appliances
1. Visual Only Strobes. Provide UL 1971 listed device with the following:
 - a. Xenon flash tube and associated lens/reflector system.
 - b. Provide with different flash intensities of 15, 15/75, 30, 75 and 110 candela.
 - c. Provide a visible label inside the lens to indicate the listed candela rating.
 - d. Mount with Red, impact resistant and flame retardant thermoplastic cover.

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- e. Wall or ceiling mounted as show on drawings with the "FIRE" lettering oriented for easy reading.
2. Combination Horn/Visual Devices. Provide UL 1480 listed device with the following:
 - a. Red, impact resistant and flame retardant thermoplastic covers.
 - b. Electronic horn with loud, penetrating output. Sound output @ 24 VDC equal to 85 dBA @ 10 ft. for reverberant room test and 93 dBA @ 10 ft. for anechoic chamber test.
 - c. Xenon flash tube and associated lens/reflector system with different flash intensities of 15, 15/75, 30, 75 and 110 candela. Furnish with a visible label inside the lens to indicate the listed candela rating.
 3. Loudspeakers. Provide UL 1480 listed device with the following for high ambient noise applications:
 - a. Red, impact resistant and flame retardant construction, wall or ceiling mounted
 - b. 15 watt power rating with 102 dB@15 watts@10 feet output
 - c. Transformer selectable for 25/70/100V system operation
 - d. Frequency response 400-4000 Hz
- G. Magnetic Door Hold Devices. Provide UL 228 listed device with the following:
1. Wall or floor mounting as indicated on drawings, complete with matching doorplate.
 2. 24VDC operation (unless otherwise required by the system) developing a minimum of 25 lbs. holding force.
- H. Isolator Module
1. Provide modules to automatically isolate wire-to-wire short circuits on an SLC Class A, Class B, or Class X branch, limiting the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch.
 2. Provide at least one isolator module for each floor or protected zone of the building.
 3. Provide automatic disconnection of the SLC when a wire-to-wire short occurs with automatic reconnection of the isolated section and when the short circuit condition is corrected.

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I. Remote Monitors and Printers

1. Monitors

- a. Provide a minimum 17", full color, TFT plasma display units with 1024 x 1024 resolution and a keyboard.
 - b. System status, system history or analog sensor status, service or history logs to be viewable on the display.
 - c. Provide password-protected status command line mode to allow user to perform disable/enable functions from the keyboard.
2. Remote printer: High-resolution 24-pin dot matrix type that is listed and labeled as an integral part of the fire alarm system.

J. Remote LCD Annunciator:

1. Primary Acknowledge, Silence, Reset Keys, Status LEDs and LCD display similar to the FACU.
2. Minimum two lines of 40 characters each and four programmable control switches and associated LEDs.
3. Operator keys shall be keyed switch enabled to prevent unauthorized use.

K. Documentation Box

1. Documentation cabinet constructed of 18 gauge steel, powder coated red, with piano hinge and key lock, and labeled "FIRE ALARM SYSTEM RECORD DOCUMENTS.' Box shall be sized to contain required documents per NFPA 72-7.7, with a minimum size of 12"x12"x3".

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Provide services of a factory authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing and adjustment of the system. Manufacturer's representatives to be available on a 24-hour basis within 150 miles of this project.
- B. Provide system complete, in accordance with drawings, specifications and with manufacturer's instructions, including conduit, boxes, wiring and accessories.
- C. Device labeling:
 1. Coordinate all system programming, including device descriptors, with Owner in advance. Submit final programming for approval prior to implementation.

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2. Label all initiating devices and associated remote indicating devices with the specific descriptor of that device. Coordinate with Owner for proper descriptors of each device. Provide a minimum 3/8-inch high lettering, located on device so it is visible from the ground.

D. Wiring Installation

1. Install wiring in conduit and tag wires at junction points.
2. Obtain from Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. Make no deviation from the written instructions without prior written approval from the Fire Alarm System manufacturer and engineer of record.
3. Color-code fire alarm conductors differently from normal building power wiring. Use one color code for alarm initiating circuit wiring and a different color code for supervisory circuits. Color code notification appliance circuits differently from alarm initiating circuits.
4. Install at least 2 vertical cable risers to serve the fire alarm system. Separate risers that are in close proximity to each other, in accordance with NFPA 72, with a minimum 2-hour rated cable assembly, 2-hour rated shaft or enclosure or 2-hour rated stairwell so that the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.
5. Install wiring to central station transmitter in a 1 inch conduit from FACU to the central station transmitter connection. Install the quantity of conductors and electrical supervision for connecting wiring as required to suit the central station monitoring function.
6. For each exterior circuit, in addition to the number of panel wires required, provide a green grounding conductor for operation of transient protection cube. Obtain ground at panel nearest to the point of cube application, but in no case exceed 28 feet of wire length.
7. Provide a dedicated Emergency Power, 120 volt circuit to power the FACU, FEP's, Communication Panels. Provide a red marking on the circuit breakers for these circuits and identify them as "Fire Alarm Circuit", Emergency Communication Circuit or Fire Alarm/ECS circuit as applicable. Ensure circuit breaker lock is installed for each circuit.

E. Smoke detectors:

1. For addressable smoke detectors, permanently write the address in the base so that it is visible with the smoke head removed, where the address is contained in the smoke head.

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2. Mount ceiling smoke detectors no less than 3 feet from a supply, return or exhaust air diffusers, and 3 feet from electronic ballasts. Coordinate with division 15 for diffuser locations.
3. Where detectors are installed in concealed locations more than 10 feet above the finished floor, or in arrangements where the detector's alarm or supervisory indicators are not visible, provide remote LED alarm light and test switch in ceiling close to detector or flush mounted on an adjacent wall.

F. Heat detectors:

1. Mount within 24" of each sprinkler head in elevator equipment room and elevator hoistway where used for elevator shunt trip activation.

G. Duct mounted smoke detectors:

1. Provide duct smoke detectors as specified on Division 23 drawings for HVAC supply, return and exhaust fans and ducts. Refer to Division 23 drawings for location and quantities.
2. Install duct smoke detectors in the supply air stream of an air handling unit downstream of filters and at least 6 feet from humidifier, preferably upstream.
3. Install duct smoke detectors within 5 feet of smoke dampers where required.
4. Install duct smoke detectors in the return air stream of an air handling unit on upstream side of outside air inlet.
5. Furnish and connect duct detectors under this Division but install them under Division 23.
6. Support sampling tube within the duct and extend at least 3/4 of the distance across the duct.
7. Mount detectors the appropriate distance from ells, turns, etc. as required by the detector manufacturer.
8. Where duct detectors are mounted above ceilings or above 6 feet in mechanical rooms, provide remote LED alarm light and test switch in ceiling close to detector or surface mounted on an adjacent wall of mechanical room.

H. Alarm Devices:

1. Wire flashing lights separately from audible alarms. When alarm signal is silenced, lights shall continue to flash until the condition responsible for the system alarm has been cleared and reset.
2. Provide synchronized visual devices throughout project.

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3. Comply with ADA regulations for mounting of strobe units. Depending upon the configuration of the strobe unit, utilize mounting requirements as follows:
 - a. Mount strobe unit 80 inches to bottom of the device faceplate, measured from the highest floor level of area served, and
 - b. Entire lens shall not be less than 80 inches or greater than 96 inches above the finished floor.
 4. Locate visual alarm devices in sleeping rooms no more than 16 feet from the head of the bed, a minimum of 24" below the ceiling with a rating of 110cd.
 5. Locate visual alarm devices in corridors per the plans but no more than 15 feet from the end of a corridor or an interruption of the viewing path such as a corridor door or an elevation change. Locate devices in corridors no more than 100 feet apart.
 6. Where devices are required in exterior spaces, in shower room areas, or other wet or harsh environments, provide wet location devices.
- I. Water Flow and Tamper Switches:
1. Assign a separately addressable, supervised point and annunciate separately each water flow switch and each valve tamper switch.
 2. Connect sprinkler water flow switches, provided under Division 21, to the fire alarm system. Refer to Division 21 drawings for location and quantity of flow switches.
 3. Install a valve status switch, furnished under Division 21, on each sprinkler system valve and PIV (Post Indicator Valve). Refer to plumbing drawings and sprinkler system shop drawings for exact location and quantity of valve status switches and PIV switches.
- J. System is to automatically actuate certain control functions and monitor or supervise points. Electrically supervise wiring to auxiliary fire alarm relays used to activate such functions or monitor/supervise points. Locate relays within 3 feet of the device controlled, such as a motor starter. Functions for which circuits are to be supervised include, but are not limited to, the following:
1. Release of door hold-open devices
 2. Shutdown of selected HVAC systems or activation of smoke control systems
 3. Stair pressurization
 4. Selected Audio system speaker output shunt (i.e. multi-purpose/lecture rooms, retail, etc.)

5. Elevator hoist way pressurization
6. Sprinkler valve status switches

3.02 TEST AND CERTIFICATION

- A. Provide a 10 day minimum notice in writing when the system is ready for final acceptance testing. Send notice after pre-testing has been completed to confirm that the system conforms to the drawings and specifications and malfunctioning or damaged devices have been replaced.
- B. Test completed fire alarm system in the presence of Owner's representative and the AHJ. After test, certify test was completed, deficiencies were corrected and system performs as specified.
- C. Upon completion of smoke detector installations, test each detector's sensitivity and compare the installed sensitivity with that recorded at the factory when the detector was manufactured and shipped. Replace detectors that test out of limits. Prepare a typewritten tabulation of these tests along with name and signature of tester. Include the following information:
 1. Smoke detector descriptor
 2. Smoke detector location in the project
 3. Sensitivity value - field test
 4. Sensitivity value - factory test
 5. Within limits - "yes" or "no"
- D. Test system in accordance with the procedures outlined in NFPA 72.

3.03 TRAINING

- A. Comply with the requirements of Division 1
- B. Provide the services of a factory authorized service representative to demonstrate the system and train the Owner's maintenance personnel. Provide a minimum of 16 hours of on-site training. Schedule training with the Owner at least 14 days in advance.
- C. Training shall follow the submitted training syllabus and shall be based upon O/M manuals, record documents, system programming, and field demonstrations.
 1. Hands-on Instruction: On-site using operational system
 2. Classroom Instruction: On-site or at another local facility
 - a. Administrative

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- b. Basic Operation
 - c. Detailed Operation
 - d. Maintenance, troubleshooting, preventive maintenance and periodic testing requirements
- D. Provide means of evaluation of trainees suitable to type of training given, report results to owner.

3.04 CLOSEOUT ACTIVITIES

A. Completion Documents

- 1. Furnish a written record of inspections, tests, and detailed test results in the form of a test log
- 2. Prepare the "Fire Alarm System Record of Completion" document per NFPA 72
- 3. Upon final acceptance furnish the following to the Owner's representative:
 - a. "Record of Completion" document
 - b. Owner's manual and installation instructions covering all system equipment
 - c. Record drawings
 - d. Copy of system software as programmed
 - e. Listing of system passwords
 - f. Spare parts list

END OF SECTION

SECTION 31-3116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Treated-zone, non-repellent chemical soil treatment.

1.02 SUBMITTALS

- A. Follow Section 01-3323 for making construction submittals.
 - 1. Product Data: Treatment and application instructions, including EPA Registered label.
 - 2. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
 - 3. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.
- B. Follow sections 01-7700 and 01-7800 for making closeout submittals.
 - 1. Soil Treatment Application Report: After application of termiticide is complete, submit report for Owner's record information, including the following as applicable:
 - a. Date and time of application
 - b. Moisture content of soil before application
 - c. Brand name and manufacturer of termiticide
 - d. Quantity of undiluted termiticide used
 - e. Dilutions, methods, volumes, and rates of application used
 - f. Areas of application
 - g. Water source for application
 - h. Re-treatment schedule
 - 2. Warranty: As specified elsewhere in this section.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 - 1. Having minimum of three (3) years documented experience.
 - 2. Approved by manufacturer of treatment materials.
 - 3. Licensed in the State in which the Project is located.
- B. Regulatory Requirements: Formulate and apply termiticides, label with a Federal Registration Number, to comply with EPA regulations and authorities having jurisdiction.

1.04 JOB CONDITIONS

- A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

- B. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.05 WARRANTY

- A. Provide five year installer's warranty against damage to building caused by termites.
 - 1. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

- A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.
- B. Manufacturers:
 - 1. Bayer Environmental Science Corp; Premise: www.backedbybayer.com/pest-management.
- C. Mixes: Mix toxicant to manufacturer's instructions.

2.02 SITE APPLIED TERMITICIDE

- A. Site Applied Termiticide for Pre-Construction: Spray applied termiticide formulated for use site prior to construction.
 - 1. Active Ingredient: Imidacloprid.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Remove non-essential wood and cellulose containing materials, including scrap wood and form boards from around foundation walls; foreign matter which could decrease effectiveness of treatment on areas to be treated shall be removed.
- C. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and footings.
- D. Termiticides may be applied before placement of compacted fill under slabs, if recommended by termiticide manufacturer.
- E. Fit filling hose connected to water source at the site with a back preventer, complying with requirements having jurisdiction.

3.02 APPLICATION - CHEMICAL TREATMENT

- A. Comply with requirements of U.S. EPA and applicable state and local codes.
- B. Spray apply toxicant in accordance with manufacturer's instructions.

- C. Apply toxicant at following locations:
 - 1. Under Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. At Both Sides of Foundation Surface: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Masonry: Treat voids.
- D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.
- E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.
- F. Apply extra treatment to structure penetration surfaces such as expansion joints, pipe or ducts, and soil penetrations such as grounding rods or posts.
- G. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- H. Re-treat disturbed treated soil with same toxicant as original treatment.
- I. If inspection or testing identifies the presence of termites, re-treat soil and re-test.
- J. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- K. Post warning signs in areas of application.
- L. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.03 INSTALLATION - SITE-APPLIED TERMITICIDE

- A. Comply with manufacturer's written instructions.

END OF SECTION