PROJECT MANUAL

IOWA STATE FAIR

SWINE-CATTLE BARN UPDATES – PHASE 1

DES MOINES, IOWA

July 14, 2025

ISF Contract No. CSWB2301
K/O Project No. 250401.00

KEFFER/OVERTON ASSOCIATES, INC. ARCHITECTS
650 SOUTH PRAIRIE VIEW DRIVE, STUDIO 103, WEST DES MOINES, IA 50266

SECTION 00 0102
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: ISF Swine-Cattle Barn Updates - Phase 1, located at: Iowa State Fairgrounds, Des Moines, Iowa..

B. Architect's Project Number: 250401.00.

C. Owner's Project Number: CSWB2301.

East 30th and University Avenue

Des Moines, Iowa 50317.

D. The Owner, hereinafter referred to as: Iowa State Fair.

1.02 DESIGN PROFESSIONALS

Architect: K/O Architects
Address: 650 S. Prairie View Dr., Studio 103
City State Zip: West Des Moines, Iowa 50266
Phone: 515-288-4821
Contact: Chip Overton
email: chip@k-o.com

Structural Engineer: Korpela Engineering
Address: 1239 73rd Street, Studio C
City State Zip: Windsor Heights, Iowa 50324
Phone: 515-271-0655
Contact: Tim Korpela
email: tim@korpelaengineering.com

MEPT Engineer: KED Bluestone
Address: 5518 NW 88th Street
City State Zip: Johnston, Iowa 50131
Phone: 515-727-0700
Contact: Matt Jahnke
email: matthew.jahnke@kedbluestone.com

Civil Engineer: Kirkham Michael
Address: 11021 Aurora Avenue
City State Zip: Urbandale, Iowa 50322
Phone: 515-270-0848
Contact: Scott Almeida
email: salmeida@kirkham.com

PART 2 PRODUCTS - NOT USED

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ADVERTISEMENT FOR BIDS

THE IOWA STATE FAIR BOARD OF DIRECTORS (OWNER) WILL RECEIVE BIDS TO PERFORM CONSTRUCTION FOR THE PROJECT TITLED "ISF SWINE-CATTLE BARN UPDATES - PHASE 1" LOCATED ON THE IOWA STATE FAIRGROUNDS, DES MOINES, IOWA.

BIDS WILL BE RECEIVED AT THE OFFICE OF K/O ARCHITECTS, 650 S. PRAIRIE VIEW DRIVE, SUITE 103, WEST DES MOINES, IOWA 50266, ON OR BEFORE 2:00 P.M., LOCAL TIME, TUESDAY, AUGUST 5, 2025.

INTERESTED BIDDERS MAY OBTAIN A SET OF BIDDING DOCUMENTS AFTER JULY 15, 2025 BY CONTACTING IOWA REPROGRAPHICS INC., 3 COLLEGE AVE., DES MOINES, IOWA, PHONE: 515-244-5705. A DOCUMENT DEPOSIT OF $100.00 OR CURRENT BUILDER'S ASSOCIATION PLAN DEPOSIT CARD IS REQUIRED. PRIOR TO BIDDING, BIDDERS ARE ENCOURAGED TO VISIT THE PROJECT SITE ON THE IOWA STATE FAIRGROUNDS, DES MOINES, IOWA.

END OF SECTION

SECTION 00 2113
INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 DOCUMENT INCLUDES

A. Invitation
   1. Bid Submission
   2. Intent
   3. Work Identified in Contract Documents
   4. Contract Time

B. Bid Documents and Contract Documents
   1. Definitions
   2. Contract Documents Identification
   3. Availability
   4. Examination
   5. Inquiries/Addenda
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C. Site Assessment
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D. Qualifications
   1. Qualifications
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E. Bid Submission
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F. Bid Enclosures/Requirements
   1. Security Deposit
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   5. Fees for Changes in the Work
   6. Bid Form Signature
   7. Additional Bid Information

G. Offer Acceptance/Rejection
   1. Duration of Offer
   2. Acceptance of Offer

1.02 RELATED DOCUMENTS

A. Document 01 1000 - Summary.

B. Document 00 1113 - Advertisement for Bids.

C. Document 00 4100 - Bid Form.

D. Document 00 4336 - Proposed Subcontractors Form.

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

F. Document 00 4373 - Proposed Schedule of Values Form.

G. Document 00 4328 - Items Eligible For Tax Rebate Form.

H. Document 00 7300 - Supplementary Conditions:

INVITATION

2.01 BID SUBMISSION

A. BIDS WILL BE RECEIVED AT THE OFFICE OF K/O ARCHITECTS, 650 S. PRAIRIE VIEW DRIVE, SUITE 103, WEST DES MOINES, IOWA 50266, ON OR BEFORE 2:00 P.M., LOCAL TIME, TUESDAY, AUGUST 5, 2025.

B. Offers submitted after the above time will be returned to the bidder unopened.

2.02 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete project named ISF Swine-Cattle Barn Updates - Phase 1 for a Stipulated Sum contract, in accordance with Contract Documents.

2.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises building construction, including general construction, structural, mechanical, and electrical Work.

2.04 CONTRACT TIME

A. Complete all work within this contract by the [15th] day of [June, 2026].

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

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

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

3.02 CONTRACT DOCUMENTS IDENTIFICATION

A. Contract Documents are identified with Owner's Project Number CSWB2301, as prepared by Architect, with Architect's Project Number 250401.00 and with contents as identified in the Project Manual.

3.03 AVAILABILITY

A. Bid documents may be obtained at Iowa Reprographics Inc., 3 College Ave., Des Moines, Iowa, Phone: 515-244-5705. A document deposit of $100.00 or current builder's association plan deposit card is required.

B. Deposit will be refunded if Bid Documents are returned complete, undamaged, unmarked and reusable, within 7 days of bid submission. Failure to comply will result in forfeiture of deposit.

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

D. Only bidders that receive Bid Documents from Iowa Reprographics will be considered Registered Plan Holders.

E. An electronic PDF copy of the Bid Documents is available from Iowa Reprographics for all Registered Plan Holders.

F. Scanned copies of Documents are not considered official Bid Documents. Scanned copies might be incomplete or inaccurate. If needed electronic PDF copies of Addenda will be issued to Registered Plan Holders only.

3.04 EXAMINATION

A. Bid Documents may be viewed at the office of Architect.

B. Bid Documents may be viewed at the office of Owner.

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

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

3.05 INQUIRIES/ADDENDA

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

B. Verbal answers are not binding on any party.

C. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to Registered Plan Holders.

3.06 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. General Requirements for Substitution Requests:
   1. Project Manual establishes standards for products, assemblies, and systems.
   2. Submit requests only for elements for which substitution is specifically allowed in the Project Manual.
   3. Provide sufficient information to determine acceptability of proposed substitutions.
   4. Provide complete information on required revisions to other work to accommodate each proposed substitution.

B. Substitution Request Time Restrictions:
   1. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 10 days before receipt of bids.

C. Substitution Request Form:
   1. Submit substitution requests by completing the form attached to this section. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
   2. Submit substitution requests by completing the form in Section 00 4325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

D. Review and Acceptance of Request:
   1. Architect may approve the proposed substitution and will issue an Addendum to known bidders.
   2. For approved substitutions, include representation of changes in the bid, if any, required in the work and changes to Contract Time and Contract Sum to accommodate such substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Sum because of changes in work necessitated by use of substitutions will not be considered.

SITE ASSESSMENT

4.01 SITE EXAMINATION

A. Examine the project site before submitting a bid.

QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS

A. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of financial position, license to perform work in the State.

B. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit AIA A305.

5.02 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.

B. Refer to General Conditions.

BID SUBMISSION

6.01 SUBMISSION PROCEDURE

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

B. Submit one copy of the executed offer on the Bid Forms provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.

C. Improperly completed information, irregularities in security deposit, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.

6.02 BID INELIGIBILITY

A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.

B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Owner, be declared unacceptable.

C. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, be waived.

D. Bids are by invitation, only from selected bidders. Bids from Unregistered Plan Holders may be returned.

BID ENCLOSURES/REQUIREMENTS

7.01 SECURITY DEPOSIT

A. Bids shall be accompanied by a security deposit as follows:

1. Each proposal must be accompanied by a certified or cashier's check drawn on an Iowa bank or a bank chartered under the laws of the United States, or a certified share draft on a credit union in Iowa or chartered under the laws of the United States, in an amount equal to five percent (5%) of the Bid Price, made payable to the Owner, or on AIA A310 Bid Bond form or form approved by the Owner for a like amount, which shall be considered as liquidated damages and shall be forfeited to the Owner if said bid is accepted and the bidder fails to execute the contract and file the required Performance Bond and Labor and Material Payment Bond as required in the Contract Documents.

B. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.

C. Include the cost of bid security in the Bid Amount.

D. After a bid has been accepted, all security deposit cashier's checks and/or share drafts will be returned, and all Bid Bond forms will be destroyed.

E. If no contract is awarded, all security deposit cashier's checks and/or share drafts will be returned, and all Bid Bond forms will be destroyed.

7.02 PERFORMANCE ASSURANCE

A. Accepted Bidder: Provide a Performance bond as described in 00 7300 - Supplementary Conditions.

7.03 INSURANCE

A. Provide an executed "Undertaking of Insurance" on the form provided stating their intention to provide insurance to the bidder in accordance with the insurance requirements of Contract Documents.

7.04 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form and Appendices.

B. Taxes: Refer to Document 00 7300 - Supplementary Conditions for inclusion of taxes, procedures for tax rebate claims, and products that are tax exempt.

7.05 FEES FOR CHANGES IN THE WORK

A. Include in the Bid Form, the overhead and profit fees on own 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.

7.06 BID FORM SIGNATURE

A. The Bid Form shall be signed by the bidder, as follows:
   1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
   2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
   3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
   4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

7.07 ADDITIONAL BID INFORMATION

A. Submit the following Supplements 24 hours after bid submission:
   1. Document 00 4328 - Items Eligible For Tax Rebate Form.
   2. Document 00 4336-Proposed Subcontractors Form: Include the names of all Subcontractors and the portions of the Work they will perform.
   3. Document 00 4373-Proposed Schedule of Values Form identifies the Bid Amount segmented into portions as requested.

OFFER ACCEPTANCE/REJECTION

8.01 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of sixty (60) days after the bid closing date.

8.02 ACCEPTANCE OF OFFER

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

B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

END OF SECTION

SECTION 00 4100
BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Owner:
Iowa State Fair Board of Directors
Iowa State Fairgrounds
Des Moines, Iowa

1.02 FOR:

A. Project: ISF Swine-Cattle Barn Updates - Phase 1

B. Owner Project Number: CSWB2301

C. Architect Project Number: 250401.00
Project Location Address 1
Des Moines, IowaProject Location ZIP

1.03 DATE: _____ (BIDDER TO ENTER DATE)

1.04 SUBMITTED BY: (BIDDER TO ENTER NAME AND ADDRESS)

A. Bidder's Company Name _____

B. Address _____

C. City, State, Zip _____

D. Contact Person's Name _____

E. Contact Person's Phone _____

F. Contact Person's email _____

1.05 OFFER

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

B. _____
_____ dollars
($_____), in lawful money of the United States of America.

C. We have included the required security deposit as required by the Instruction to Bidders.

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

1.06 ACCEPTANCE

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

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

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to

Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.07 CONTRACT TIME

A. If this Bid is accepted, we will:

B. Complete the work according to the Construction Schedule outlined in Section 00 2113 - Instructions to Bidders.

1.08 CHANGES TO THE WORK

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

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

1.09 ADDENDA

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

1.10 BID FORM SUPPLEMENTS

A. We agree to submit the following Supplements to Bid Forms within 24 hours after submission of this bid for additional bid information:
   1. Document 00 4328 - Items Eligible For Tax Rebate Form.
   2. Document 00 4336: Include the names of Subcontractors and the portions of the Work they will perform.
   3. Document 00 4373 - Proposed Schedule of Values Form identifies the Bid Price/Sum segmented into portions as requested.

1.11 BID FORM SIGNATURE(S)

A. The Corporate Seal of

B. _____

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

D. was hereunto affixed in the presence of:

E. _____

F. (Signature - Authorized signing officer, Title)

END OF SECTION

SECTION 00 4325
SUBSTITUTION REQUEST FORM - DURING PROCUREMENT

FORM TO:

K/O ARCHITECTS; 650 SOUTH PRAIRIE VIEW DRIVE, STUDIO 103, WEST DES MOINES, IA 50266, PHONE: 515-288-4821, EMAIL: DESIGN@K-O.COM.

PROJECT: _____

SPECIFIED ITEM: _____

SECTION: _____

PAGE: _____

PARAGRAPH: _____

DESCRIPTION: _____

THE UNDERSIGNED REQUESTS CONSIDERATION OF THE FOLLOWING:

PROPOSED SUBSTITUTION: _____

REASON FOR SUBSTITUTION: _____

ATTACHED DATA INCLUDES PRODUCT DESCRIPTION, SPECIFICATIONS, DRAWINGS, PHOTOGRAPHS, PERFORMANCE AND TEST DATA ADEQUATE FOR EVALUATION OF THE REQUEST: APPLICABLE PORTIONS ARE CLEARLY IDENTIFIED.

ATTACHED DATA ALSO INCLUDES DESCRIPTION OF CHANGES TO CONTRACT DOCUMENTS WHICH PROPOSED SUBSTITUTION WILL REQUIRE FOR ITS PROPER INSTALLATION.

THE UNDERSIGNED STATES THAT THE FOLLOWING PARAGRAPHS, UNLESS MODIFIED ON ATTACHMENTS, ARE CORRECT.

1. **The proposed substitution does not affect dimensions shown on Drawings.**
2. **The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.**
3. **The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.**
4. **The product, material or method proposed for substitution meets or exceeds the current specifications.**
5. **Maintenance and service will be locally available for the proposed substitution.**

THE UNDERSIGNED STATES THAT THE FUNCTION, APPEARANCE, QUALITY, AND PERFORMANCE OF THE PROPOSED SUBSTITUTION ARE EQUIVALENT OR SUPERIOR TO THE SPECIFIED ITEM (PROVIDE ADDITIONAL INFORMATION IF REQUIRED).

SUBMITTED BY (FIRM NAME): _____
CONTACT PERSON'S NAME: _____

SIGNATURE: _____
ADDRESS: _____
PHONE: _____
EMAIL: _____
DATE: _____

ACTION BY ARCHITECT OR ENGINEER: ACCEPTED NOT ACCEPTED
DATE: _____

END OF SECTION

SECTION 00 4328
ITEMS ELIGIBLE FOR TAX REBATE FORM

PARTICULARS

THE FOLLOWING IS THE LIST OF TAX REBATE ITEMS REFERENCED IN THE BID SUBMITTED BY:

(BIDDER) _____

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

LIST OF MATERIALS, EQUIPMENT, AND OTHER ITEMS ELIGIBLE FOR TAX REBATE (ADD ADDITIONAL LINES OR PAGES AS NECESSARY):

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END OF SECTION

SECTION 00 4336
PROPOSED SUBCONTRACTORS FORM

PARTICULARS

1.01 HEREWITH IS THE LIST OF SUBCONTRACTORS REFERENCED IN THE BID SUBMITTED BY:

1.02 (BIDDER) _____

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

1.04 THE FOLLOWING WORK WILL BE PERFORMED (OR PROVIDED) BY SUBCONTRACTORS AND COORDINATED BY US:

LIST OF SUBCONTRACTORS (ADD ADDITIONAL LINES OR PAGES AS NECESSARY):

WORK SUBJECT SUBCONTRACTOR NAME

A. _____
B. _____
C. _____
D. _____
E. _____
F. _____
G. _____
H. _____
I. _____
J. _____
K. _____
L. _____
M. _____
N. _____
O. _____
P. _____
Q. _____
R. _____
S. _____
T. _____
U. _____

END OF SECTION

SECTION 00 4373
PROPOSED SCHEDULE OF VALUES FORM

PARTICULARS

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

1.02 (BIDDER) _____

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

ITEM DESCRIPTIONS AND VALUE - ATTACH TO THIS FORM AIA G703 CONTINUATION SHEET FILLED OUT AS INDICATED TO SHOW SCHEDULE OF VALUES BY WORK GROUP OR TASK FOR EACH SEPARATE BUILDING AS INDICATED IN DOCUMENTS.

END OF SECTION

SECTION 00 5000
CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. See Section 00 5200 - Agreement Form for the Agreement form to be executed.

B. See Section 00 7200 - General Conditions for the General Conditions.

C. See Section 00 7300 - Supplementary Conditions for the Supplementary Conditions.

D. The Agreement is based on AIA A101.

E. The General Conditions are based on AIA A201.

1.03 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in Contract Documents.

B. Bond Forms:
   1. Bid Bond Form: AIA A310.
   2. Performance and Payment Bond Form: AIA A312.

C. Post-Award Certificates and Other Forms:
   1. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).

D. Clarification and Modification Forms:
   1. Architect's Supplemental Instructions Form: AIA G710.
   2. Construction Change Directive Form: AIA G714.
   3. Change Order Form: AIA G701.

E. Closeout Forms:
   1. Certificate of Substantial Completion Form: AIA G704.

1.04 REFERENCE STANDARDS

A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum; 2017.

B. AIA A201 - General Conditions of the Contract for Construction; 2017.

C. AIA A310 - Bid Bond; 2010.

D. AIA A312 - Performance Bond and Payment Bond; 2010.

E. AIA G701 - Change Order; 2017.

F. AIA G702 - Application and Certificate for Payment; 1992.

G. AIA G703 - Continuation Sheet; 1992.

H. AIA G704 - Certificate of Substantial Completion; 2017.

I. AIA G710 - Architect's Supplemental Instructions; 2017.

J. AIA G714 - Construction Change Directive; 2017.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 5200
AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

1.02 THE AGREEMENT TO BE EXECUTED IS IS BASED ON THE DOCUMENT ATTACHED TO THIS LINK - HTTPS://BIT.LY/3Z9IQH7

A. Use AIA Document A101 - 2017.

1.03 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

END OF SECTION

SECTION 00 7200
GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS BASED ON THE DOCUMENT ATTACHED TO THIS LINK - HTTPS://BIT.LY/3KLYKFP

A. Use AIA Document A201 - 2017 as modified with the Supplementary Conditions.

SUPPLEMENTARY CONDITIONS

2.01 REFER TO DOCUMENT 00 7300 - SUPPLEMENTARY CONDITIONS FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF SECTION

SECTION 00 7300
SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

A. These Supplementary Conditions amend and supplement the General Conditions defined in Document 00 7200 - General Conditions and other provisions of Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.

B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.02 RELATED SECTIONS

1. Section 00 5000 - Contracting Forms and Supplements.

1.03 MODIFICATIONS TO GENERAL CONDITIONS

1.04 THE FOLLOWING SUPPLEMENTS ONLY THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION (AIA DOCUMENT A201 - 2017 EDITION). WHERE A PORTION OF THE GENERAL CONDITIONS IS MODIFIED OR DELETED BY THESE SUPPLEMENTARY CONDITIONS, THE UNALTERED PORTIONS OF THE GENERAL CONDITIONS, WHICH ARE NOT IN CONFLICT, SHALL REMAIN IN EFFECT.

ARTICLE 1 - GENERAL PROVISIONS

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.4 Add new subparagraph:

If any part of any Contractor's work depends on proper execution or results upon the work of any other Contractor, each Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution of his work. His failure to so inspect and report shall constitute an acceptance of the other Contractor's work except as to defects which may develop after the execution of his work. Each Contractor shall measure work already in place and shall at once report to the Architect/Engineer any discrepancy between the executed work and the drawings.

ARTICLE 3 - CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.2.1 Add new subparagraph:

Should any Contractor find discrepancies in or omissions from the drawings or documents or should he be in doubt as to the meaning, he should at once notify the Architect/Engineer who will send written instructions to all Contractors covering items in question. This provision is intended to cover matters that may be obscure, indefinite or in conflict where the cost of the work is affected. No decision shall be given when a standard is established and work is required to meet that standard, or where the right of approval, selection or interpretation is reserved to the Engineer to be exercised during the progress of the work. All explanations, interpretations and instructions prior to the time the contract is signed shall be in writing and unless they are expressed in the contract, they will not be binding. No verbal statements by any representative of Owner, Contractor, Engineer or anyone connected with the work will be binding in any way.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.2.1 Add new subparagraph:

The Contractors shall inform themselves of the conditions under which the work is to be performed at the site of the work, the structure of the ground,

the obstacles which may be encountered, and all other relevant matters concerning the work to be performed. The Contractors shall not be allowed any extra compensation by reason of any matter or thing concerning which the Contractor might have fully informed himself, because of his failure to have so informed himself prior to bidding.

3.4 LABOR AND MATERIALS

3.4.4 Add new subparagraph:

Whenever in any of the Contract Documents an article, material or equipment is defined by describing a proprietary product or by using the name of a manufacturer or vendor, the term "equal", if not inserted, shall be implied. The specified article, material or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency and quality desired and shall not be construed in such a manner as to exclude manufacturer's products of comparable quality, design and efficiency. The Contractor shall comply with the requirements of the Contract Documents relative to the Owner's approval of materials and equipment before they are incorporated in the project.

3.5 WARRANTY

3.5.1.1 Add new subparagraph:

In case of work performed by Subcontractors and where guarantees are required, secure warranties from Subcontractors addressed to and in favor of the Owner.

Deliver copies of same to Architect upon completion of work.

3.6 TAXES

3.6.1 Add new subparagraph:

By virtue of statutory authority, the Contractors for this work shall pay the “Iowa Retail Sales Tax” and the “Iowa Use Tax” on all materials used in the fulfillment of this contract. Each Contractor and Subcontractor shall, as work progresses, prepare a detailed, itemized record showing the name of the supplier from whom the materials are purchased and the amount of the sales and/or use tax paid thereon. The completed record shall be submitted to the Owner with his request for final payment. The State Department of Revenue has ruled that Owners recovering sales and use tax shall do so within sixty days after acceptance of the work by the Owner. Reports shall be made on Form 35-002.

3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

3.7.6 Add new subparagraph:

Contractor shall make application for, obtain and pay for all necessary local permits, inspection fees, etc., for all work covered by the drawings and specifications except that the Owner will obtain the Building Permit.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.2.1 Add new subparagraph:

Each Contractor is to schedule his work so as to cause minimum interference with progress of other Contractor.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.9.1 Add new subparagraph:

Additional provisions pertaining to shop drawings and samples are included in Section 01 3000 - Administrative Requirements.

3.14 CUTTING AND PATCHING

3.14.3 Add new subparagraph:

Additional provisions for cutting and patching are included in Section 01 7000 - Execution and Closeout Requirements.

3.15 CLEANING UP

3.15.3 Add new subparagraph:

Additional provisions for cutting and patching are included in Section 01 7000 - Execution and Closeout Requirements.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

9.3.1.3 Add new subparagraph:

Such Applications shall include waivers of the lien from the Contractor, Subcontractors and material suppliers to substantiate the dispersal of the previous progress payment.

9.4 CERTIFICATES FOR PAYMENT

9.4.1.1 Add new subparagraph:

On or about the first day of each calendar month, the Owner will make partial payment to the Contractor for work performed in the preceding month on estimate certified by the Contractor and the Architect as follows: 95% of the completed portions of bid items incorporated in the work, (no payment for materials stored on the site, or incomplete portions bid items), less aggregate of previous payments. Final payment to be made thirty (30) days after completion of work and acceptance by Owner, all according to the laws of the State of Iowa.

9.8 SUBSTANTIAL COMPLETION

9.8.1.1 Add new subparagraph:

Each prime contractor assumes the responsibility for notifying the Owner in writing when ready for final inspection. This letter to the Owner is to include approximate date after which the prime contractor will be ready for final inspection. When the Owner, on the basis of an inspection, determines that the work is substantially complete, he will then issue a Certificate of Substantial Completion.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 Add new subparagraph:

Precautions shall be exercised at all times for the protection of persons (including employees) and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery, equipment and all hazards shall be guarded or eliminated in accordance with safety provisions of the manual of Accident Prevention in Construction, published by the Associated General Contractors of America to the extent that such provisions are not in contravention of applicable law.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.9 Add new subparagraphs:

Water Protection: At all times protect the excavations, trenches, and/or the building from damage from rain water, spring water, ground water, backing up of drains or sewer, etc. Provide all pumps and equipment and enclosures to give this protection.

Temporary Drainage: Construct and maintain all necessary temporary drainage and do all pumping necessary to keep the excavations and basement free of water.

Snow and Ice: Remove all snow and ice as may be required for the proper protection and/or prosecution of the work.

Bracing, Shoring and Sheeting: (Each Contractor's responsibility) Provide all shoring, bracing and sheeting as required for safety and for the proper execution of the work. Remove when work is completed.

Guard Lights: (Each Contractor's responsibility) Provide and maintain guard lights at all barricades, railings, obstructions in the streets, roads or sidewalks and at all trenches or pits adjacent to public walks or roads.

Weather Protection: At all times provide protection against weather -- rain, wind, storms, frost or heat -- so as to maintain all work, materials, apparatus and fixtures free from injury or damage. At the end of the day's work, all new work likely to be damaged shall be covered.

Cold Weather: During cold weather, protect all work from damage. If low temperatures make it impossible to continue operations safely in spite of cold weather precautions, work shall cease after notifying the Architect/Engineer.

Sidewalks: (Each Contractor's responsibility) Protect all sidewalks (existing) and if damaged, make all necessary repairs at Contractor's own expense. Condition of existing sidewalks should be checked before construction work is started.

Other Protection: All other protective measures not mentioned above which may be required shall be furnished by the particular Contractor responsible for such protection.

Damage: Any work damaged by a failure of any Contractor to provide protection as required shall be removed and replaced with new work at the Contractor's expense.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S INSURANCE AND BONDS

Add the following sentence:

11.1.2 Such coverage shall be maintained by insurance carriers acceptable to Owner.

Delete 11.1.3 and substitute the following paragraphs:

11.1.3 Contractor shall carry Workmen's Compensation Insurance and liability insurance in the form and with insurers satisfactory to the Owner to protect the Contractor and the Owner from any claims, demands or expenses on account of injuries to persons and property arising out of the Work under Contract, whether such operations be by himself or any Subcontractor or by anyone directly employed by either of them. Coverage minimum as follows:

1. Workers Compensation and Employers' Liability:
   E.L. Each Accident - $1,000,000
   E.L. Disease - Ea Employyee - $1,000,000
   E.L. Disease - Policy Limit - $1,000,000

The Contractor shall take out and maintain during the life of the contract, such public liability, property damage, and contractor's contingent insurance as shall protect him and any subcontractor performing work covered by this contract from claims for damages for personal injury, including accidental death, as well as from claims for property damage which may arise from operations under this contract, whether such operations be by the contractor or by any subcontractor or anyone directly or indirectly employed by either of them, and the amount of such insurance shall be not less than the following:

1. Commercial General Liability:
   Each Occurance - $2,000,000
   Damge to Rented Premises (ea occurance) - $100,000
   Med Exp (any one person) - $10,000
   Personal & Adv Injury - $1,000,000
   General Aggregate - $2,000,000
   Products - Comp/OP Agg - $2,000,000
2. Umbrella Liability:
   Each Occurance - $10,000,000
   Aggregate - $10,000,000

The Contractor shall take out and maintain during the life of this contract, automobile public liability insurance if any motor vehicles are engaged in the

operation, within the terms of this contract, on the site of the work to be performed thereunder, covering the use of all such motor vehicles owned, rented, and non-owned. The amount of such insurance shall be not less than the following:

1. Automobile Liability:

Combined Single Limit (ea accident) - $2,000,000

The Contractor shall submit to the Owner prior to the time any work is performed, properly executed insurance certificates and receipts showing payment in advance for all premiums on all policies required. These certificates shall provide for ten days written notice in the
event of cancellation or renewal of insurance and shall show the State of Iowa, the Iowa State Fair Board as additional insured.

11.2 OWNER'S INSURANCE

11.2 Add the following sentence:

The Contractor shall name the Owner as Additional Insured under the Contractors General Liability and Automobile Liability policy for the duration of the project. Provide the Owner with proof of continual insurance coverage for the duration of the project.

11.4 PERFORMANCE AND PAYMENT BOND

11.4 Delete entire paragraph and insert the following as titled:

The successful Contractors must qualify for and execute satisfactory performance and material payment bond in full amount of contract price, executed on form approved by Architect and Owner, insuring fulfillment of all provision of contract within time limit as hereinafter noted or agreed upon, and covering all guarantees herein provided for and prompt payment of the parties furnishing materials or labor required in prosecution of the work. The Contractor will pay the premium on this bond.

(a) NOTICE TO SURETIES

Attention of sureties is particularly called to the following directions: Final inspection and acceptance of work shown by drawings and specifications forming a part of contract shall not be binding conclusively upon Owner if it shall subsequently appear that the Contractor has willfully or through collusion with representatives either of Owner or Architect, employed inferior materials or workmanship or has departed from the terms of the contract. In any case Owner shall have right to recover against Contractor and his sureties all cost of such work together with such other damage as Owner may suffer because of default of Contractor in premises, same as though final payment and acceptance had not been made.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

12.2.6 Add new subparagraph:

Contractor shall guarantee all work against faulty workmanship and materials for a period of one (1) year after the date of final acceptance of the work by the Owner, unless otherwise set out in the "General Requirements." Contractor shall repair or replace any defective workmanship and materials in a manner acceptable to Owner, without expense to Owner, within ten (10) days. Owner shall make said repairs or replacements and charge the cost to the Contractor.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.6 USE OF PREMISES

13.6 Add new paragraph:

Owner reserves the right to enter upon premises and store or attach such fixtures and furniture as he may elect without in any way affecting the

contract, providing such use of premises does not interfere with completion of Contractor's work. In addition to the foregoing, the Owner, upon certification by the Engineer that the Work is substantially completed, reserves the right to occupy the premises, this action in no way implies acceptance of the Work or does it relieve the Contractor from the obligation to continue his work to completion, the Owner in occupying the building to be liable for actual damage done to the building and caused by such occupancy.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

14.4 EMERGENCY TERMINATION

14.4.4 Add new paragraph:

The provisions of law contained in Chapter 573A of the Code of Iowa to provide for the termination of contracts for the construction of public improvements when construction or work thereon is stopped because of a national emergency, shall apply to and become a part of this contract and shall be binding upon all parties hereto, including Subcontractors and Sureties upon any bond given or filed in connection therewith.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: ISF Swine-Cattle Barn Updates - Phase 1

B. Owner's Name: Iowa State Fair.

C. Architect's Name: K/O Archtiects.

D. The Project consists of Updates which includes repairs and new construction elements to the Swine and Cattle Barns at the Iowa State Fairgrounds.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

B. Complete work as indicated in Section 00 2113 - Instructions to Bidders.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 4100.

B. Scope of alterations work is indicated on drawings.

C. Plumbing: Replace existing system with new construction.

D. HVAC: Replace existing system with new construction.

E. Electrical Power and Lighting: Replace existing system with new construction.

1.04 WORK BY OWNER

A. Contractor shall be responsible for providing all blocking, accessories, fasteners, site prep, and field modifications required for all Owner supplied, and Owner supplied and installed items.
   1. Contractor shall coordinate with the Owner prior to the Owner's ordering of supplied items by providing field measurements, support locations, and review of Owner supplied shop drawings.

B. Owner will supply and install the following:
   1. Metal Grating assembly at room Chase 18 at the Swine Barn.
   2. Metal Fencing and Gates closing off south side of new building at the Cattle Barn.
   3. Solid Surface integral sinks, counters, and backsplashes.
   4. Solid Surface sills and aprons at new windows shown on drawings.
   5. Signage and Room Signage.

C. Owner will supply the following to the contractor for installation:
   1. Ground Faced Concrete Masonry Units.
   2. Toilet Partition assemblies.
   3. Restroom accessories:
      a. Grab Bars.
      b. Mirrors.
      c. Toilet Paper Dispensers.
      d. Baby Changing Stations.
      e. Soap Dispensers.
   4. Custodial accessories:
      a. Mop Holders.
      b. Hooks

D. The Owner will remove all signage and plaques prior to construction. Signage and plaques that remain on the wall shall be included in the demolition scope.

E. The Owner will salvage select plumbing fixtures prior to construction. All plumbing fixtures that remain will be the responsibility of the contractor to remove prior to the start of work.

1.05 OWNER OCCUPANCY

A. Owner intends to continue to occupy portions of the buildings under construction, adjacent buildings, and the grounds for various events during the entire construction period.

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

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

D. Schedule the Work to accommodate Owner occupancy.

E. Schedule the Work to accommodate Owner occupancy of adjacent properties.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.
   4. Use of nearby site and premises by the public.

C. 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.

D. Existing building spaces may not be used for storage.

E. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. 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.
   3. Prevent accidental disruption of utility services to other facilities.

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.

1.02 RELATED REQUIREMENTS

A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.

1.03 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. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 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.
   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 one electronic copy of each Application for Payment.

J. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 3000.
   2. Current construction photographs specified in Section 01 3000.
   3. Partial release of liens from major subcontractors and vendors.
   4. Project record documents as specified in Section 01 7800, for review by Owner which will be returned to the Contractor.

5. Affidavits 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.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
   4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

F. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
   3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:

1. All closeout procedures specified in Section 01 7000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Progress photographs.

G. Coordination drawings.

H. Submittals for review, information, and project closeout.

I. Number of copies of submittals.

J. Requests for Interpretation (RFI) procedures.

K. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Dates for applications for payment.

B. Section 01 6000 - Product Requirements: General product requirements.

C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

A. AIA G716 - Request for Information; 2004.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required:

1. Owner.
2. Architect.
3. Contractor.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract, Engineers and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

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

3.02 SITE MOBILIZATION MEETING

A. Architect will schedule meeting at a designated location prior to Contractor occupancy.

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

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

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

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Engineers.
5. Contractor's superintendent.

6. Major subcontractors.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Maintenance of progress schedule.
   7. Corrective measures to regain projected schedules.
   8. Planned progress during succeeding work period.
   9. Maintenance of quality and work standards.
   10. Effect of proposed changes on progress schedule and coordination.
   11. Other business relating to work.

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

3.04 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

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

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

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

E. Submit updated schedule with each Application for Payment.

3.05 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.
   4. Structural framing in progress and upon completion.
   5. Enclosure of building, upon completion.
   6. Final completion, minimum of ten (10) photos.

E. Take photographs as evidence of existing project conditions as follows:
   1. 1. Photos shall be representative of all work progress as indicated on Schedule of Values as provided with Pay Application.

F. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   2. Consult with Architect for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software, photos must be resized to not exceed 400 KB in file size each.
   1. Delivery Medium: via download from a project sharing website, or provide access to a cloud based sharing service (i.e. Dropbox, etc.).
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.

H. Quantity: minimum of 25 shall be submitted monthly with each Application for Payment.

3.06 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.07 REQUESTS FOR INTERPRETATION (RFI)

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

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

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Owner.
      a. Use AIA G716 - Request for Information .
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

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

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Note dates of when each request is made, and when a response is received.
   2. Highlight items for which a timely response has not been received to date.
   3. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   3. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.08 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Format schedule to allow tracking of status of submittals throughout duration of construction.

4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
    a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

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

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

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

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

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

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.12 NUMBER OF COPIES OF SUBMITTALS

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

B. Extra Copies at Project Closeout: See Section 01 7800.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.

2. Retained samples will not be returned to Contractor unless specifically so stated.

3.13 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   3. Transmit using approved form.
      a. Use Contractor's form, subject to prior approval by Architect.
   4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Deliver submittals to Architect at business address.
   8. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
      c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
   9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   10. Provide space for Contractor and Architect review stamps.
   11. When revised for resubmission, identify all changes made since previous submission.
   12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   14. Submittals not requested will not be recognized or processed.
   15. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Submit concurrently with related shop drawing submittal.
   4. Do not submit (Material) Safety Data Sheets for materials or products.
   5. Submit sustainable design reporting submittals under separate cover.

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

D. Samples Procedures:
   1. Transmit related items together as single package.

2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.14 SUBMITTAL REVIEW

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

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

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

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

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

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Control of installation.

F. Mock-ups.

G. Tolerances.

H. Manufacturers' field services.

I. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2025.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

1.04 DEFINITIONS

A. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 SUBMITTALS

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

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.

1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
    a. Full name.
    b. Professional licensure information.
    c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit 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.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
   4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
   2. 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.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports 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.

H. 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.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.07 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.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing.

B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

C. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

D. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

E. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.

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 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the

following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Room Mock-ups: Construct room mock-ups as indicated on drawings. Coordinate installation of materials, products, and assemblies as required in specification sections; finish according to requirements. Provide required lighting and any supplemental lighting where required to enable Architect to evaluate quality of the mock-up.

E. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

F. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

G. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

H. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.

2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
    a. To provide access to Work to be tested/inspected.
    b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    c. To facilitate tests/inspections.
    d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
1. Observer subject to approval of Architect.
2. Observer subject to approval of Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 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.

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. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

I. Field offices.

1.02 REFERENCE STANDARDS

1.03 TEMPORARY UTILITIES

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

B. Existing facilities may be used.

C. Connect to existing power service in coordination with the Owner’s staff. Power consumption shall not disrupt Owner’s need for continuous service. Owner to pay for power consumed.

D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

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. Phone: On-site cellular phone service for all project key personnel.
   2. Email: Account/address for all project key personnel.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities is not permitted.

C. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.09 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.10 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. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

F. Existing parking areas may be used for construction parking. Contractor might be asked to move to a different location based on Owner's need to use parking area and/or weekly event schedule.

1.11 WASTE REMOVAL

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

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

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

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

1.12 PROJECT IDENTIFICATION

A. No identification signs are allowed except those required by law.

1.13 FIELD OFFICES

A. Office: At contractors discretion. No special accommodations will be provided by Owner. Locate in accordance with Owner direction.

B. Material staging and storage will occur at a location adjacent to the site as directed by Owner.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

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. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Identification of Owner-supplied products.

B. Section 01 4000 - Quality Requirements: Product quality monitoring.

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

1.03 SUBMITTALS

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

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

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

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

2.02 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.

C. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.
   2. Containing lead, cadmium, or asbestos.

D. Where other criteria are met, Contractor shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.
   2. Have longer documented life span under normal use.
   3. Are made of recycled materials.

2.03 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.

2.04 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 SUBSTITUTION LIMITATIONS

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with all requirements specified in this section.
   1. Submit substitution requests by completing the form in Section 00 4325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 1000 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

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

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

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

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

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

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

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

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

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

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

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

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

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

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

H. Provide off-site storage and protection when site does not permit on-site storage or protection.

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

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

K. Do not store products directly on the ground.

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

M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

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

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

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

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures.

B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

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

D. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.

E. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

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

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of 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.

1.05 QUALIFICATIONS

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

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

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

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

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

B. Notify affected utility companies and comply with their requirements.

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

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

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

F. Coordinate completion and clean-up of work of separate sections.

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

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

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

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

PART 3 EXECUTION

3.01 EXAMINATION

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

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

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

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

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

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

3.02 PREPARATION

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

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

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

3.03 PREINSTALLATION MEETINGS

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

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

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

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

3.04 LAYING OUT THE WORK

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

B. Promptly notify Architect of any discrepancies discovered.

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

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

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

F. Utilize recognized engineering survey practices.

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

H. Periodically verify layouts by same means.

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

3.05 GENERAL INSTALLATION REQUIREMENTS

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

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

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

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

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

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

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

B. See Alterations article above for additional requirements.

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

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

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

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

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

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

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

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

3.08 PROGRESS CLEANING

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

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

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

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

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

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

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

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

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

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

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

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.12 ADJUSTING

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

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

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

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

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

E. Clean filters of operating equipment.

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

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

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

3.14 CLOSEOUT PROCEDURES

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

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

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

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

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

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

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

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

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

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 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions and 00 7300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. 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.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. 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.

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. Specifications: 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.

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.

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. Do not use Project Record Documents as maintenance drawings.

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. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into a series of PDF files for Owner's 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: Provide also to Owner one 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 20 pound paper.

I. Drawings: Provide in PDF format and a hard copy 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. Operation and maintenance data.
c. Field quality control data.
d. Photocopies of warranties and bonds.

4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.06 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.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

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

D. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

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

F. Section 31 2000 - Earthwork: Fill material for filling holes, pits, and excavations generated as a result of removal operations; and Rough and fine grading

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

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

B. Site Plan: Indicate:
   1. Vegetation to be protected.
   2. Areas for temporary construction and field offices.
   3. Areas for temporary and permanent placement of removed materials.

C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
   1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
   2. Demolition firm qualifications.

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

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: See Section 31 2000.

PART 3 EXECUTION

3.01 DEMOLITION

A. Remove masonry walls, plumbing, concrete slab, curbs, foundations, electrical, and windows required to accomplish new work.

B. Remove all other paving and curbs within site boundaries.

C. Within area of new construction, remove foundation walls and footings to minimum 2 feet below finished grade.

D. Outside area of new construction, remove foundation walls and footings to minimum 2 feet below finished grade.

E. Remove concrete slabs on grade within site boundaries.

F. Remove other items indicated, for salvage, relocation, and recycling.

G. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 01 7000.

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

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged or relocated have been removed.

E. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.

F. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

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

H. Hazardous Materials:
   1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

I. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

J. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
   4. In areas of removed masonry and concrete, remove materials to the nearest control joint or joint in material to facilitate new construction.

B. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

C. Remove existing work as indicated and required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
   2. Remove items indicated on drawings.

D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch to match new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).

B. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2024.

C. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2025a.

D. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.

E. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.

F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

G. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

H. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

I. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

J. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.

K. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.

L. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

M. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.

N. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.

O. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.

P. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2020.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete, including concrete materials, mixture design, including formwork, reinforcement, placement procedures, and finishes.

1.04 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.05 ACTION SUBMITTALS

A. Design Mixtures: For each concrete mixture, include the following:
   1. Mixture identification.
   2. Minimum 28-day compressive strength.
   3. Durability exposure class.

4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
12. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
13. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
14. Intended placement method.
15. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

B. Shop Drawings:
1. 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.
2. Vapor Barriers.
3. Form Ties and Accessories.
4. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    a. Location of construction joints is subject to approval of the Architect.

1.06 INFORMATIONAL SUBMITTALS

A. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

1.07 QUALITY ASSURANCE

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.09 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301unless modified by requirements in the Contract Documents.

2.02 CONCRETE MATERIALS

A. Source Limitations:
   1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
   2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
   3. Obtain aggregate from single source.
   4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:
   1. Portland Cement: ASTM C150/C150M, Type I gray.
   2. Fly Ash: ASTM C618, Class C or F.

C. Normal-Weight Aggregates: ASTM C33/C33M coarse aggregate or better, graded. Provide aggregates from a single source.
   1. Alkali-Silica Reaction: Comply with one of the following:
      a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
      b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
      c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
   2. Maximum Coarse-Aggregate Size: 3/4 nominal UNO,
   3. Maximum Course-Aggregate Size for precast topping: 3/8” limestone chip.
   4. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   2. Retarding Admixture: ASTM C494/C494M, Type B.
   3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
   5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.03 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
   1. Color:
      a. Ambient Temperature Below 50 deg F: Black.
      b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
      c. Ambient Temperature Above 85 deg F: White.

C. Water: Potable or complying with ASTM C1602/C1602M.

D. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

2.04 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60; 60 ksi minimum yield strength; deformed.

B. Weldable Reinforcing Bars: ASTM A 706, Grade 60; 60 ksi minimum yield strength; deformed.

C. Steel Bar Mats: ASTM A184/A184M, assembled with clips.

2.05 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.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

C. Tie wire: minimum 16 gage black annealed wire.

2.06 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
   1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash or Other Pozzolans:15 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
   1. Use water-reducing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete.

2.07 CONCRETE MIXTURES

A. Normal-weight concrete used for footings, foundation walls and interior slabs.
   1. Minimum Compressive Strength: 4000 psi at 28 days.
   2. Maximum w/cm: 0.45.
   3. Slump Limit: 4 inches , plus or minus 1 inch, plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site 8”max.
   4. Air Content:
      a. Exposed : 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
   2. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
   1. Daily access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
   4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.03 INSTALLATION OF 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.
   1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
   3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.04 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
   1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
   2. Continue reinforcement across construction joints unless otherwise indicated.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated.
   1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Doweled Joints:
   1. Install dowel bars and support assemblies at joints where indicated on Drawings.

3.05 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
   1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
   2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
   1. If a section cannot be placed continuously, provide construction joints as indicated.
   2. Deposit concrete to avoid segregation.
   3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
      a. Do not use vibrators to transport concrete inside forms.
      b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
      c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
      d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
   2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   3. Maintain reinforcement in position on chairs during concrete placement.
   4. Screed slab surfaces with a straightedge and strike off to correct elevations.
   5. Level concrete, cut high areas, and fill low areas.
   6. Slope surfaces uniformly to drains where required.
   7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
   8. Do not further disturb slab surfaces before starting finishing operations.

3.06 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:
   1. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
      a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
      b. Remove projections larger than 1/4 inch.
      c. Patch tie holes.
      d. Surface Tolerance: ACI 117 Class B.
      e. Locations: Apply to concrete surfaces exposed to public view.

B. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:
   1. Smooth-Rubbed Finish:
      a. Perform no later than one day after form removal.
      b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
      c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
      d. Maintain required patterns or variances as shown on Drawings.

3.07 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish:
   1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
   2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
   3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   4. Do not add water to concrete surface.
   5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
   6. Apply a trowel finish to surfaces exposed to view.
   7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
      a. Slabs on Ground:
         1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.08 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:
   1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
   2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
   3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
   1. Cast-in inserts and accessories, as shown on Drawings.
   2. Screed, tamp, and trowel finish concrete surfaces.

3.09 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
   2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
   3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
   1. Begin curing immediately after finishing concrete.
   2. Interior Concrete Floors:
      a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
         1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
            (a) Lap edges and ends of absorptive cover not less than 12-inches.
            (b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
         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.
            (a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            (b) Cure for not less than seven days.
         3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

(a) Water.
(b) Continuous water-fog spray.

4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month(s).
   2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete:
   1. Repair and patch defective areas when approved by Architect.
   2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
      a. Limit cut depth to 3/4 inch.
      b. Make edges of cuts perpendicular to concrete surface.
      c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
      d. Fill and compact with patching mortar before bonding agent has dried.
      e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
      a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
      b. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:
   1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
      a. Correct low and high areas.
      b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   2. Repair finished surfaces containing surface defects, including 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.

3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
    a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.
    c. Place patching mortar before bonding agent has dried.
    d. Compact patching mortar and finish to match adjacent concrete.
    e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
        1) Project name.
        2) Name of testing agency.

3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:
1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C172/C172M shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
b. Perform additional tests when concrete consistency appears to change.
3. Slump Flow: ASTM C1611/C1611M:
a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
b. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M:
a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compressive-Strength Tests: ASTM C39/C39M.

a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
    a. 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.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
        1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.14 PROTECTION

A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water cleaning of Existing and New Masonry surfaces.

B. Replacement of Brick units.

C. Repointing mortar joints.

D. Repair of damaged masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting.

B. Section 04 2000 - Unit Masonry: Brick masonry units.

1.03 REFERENCE STANDARDS

A. ACI SPEC-548.14 - Specification for Repairing Concrete with Epoxy Mortar; 2014.

B. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. Review conditions of installation, installation procedures, and coordination with related work.

1.05 SUBMITTALS

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

B. Product Data: Provide data on cleaning compounds.

C. Shop Drawings: Indicate setting details of stone. Detail shoring.

D. Samples: Submit four samples of face brick units to illustrate matching color, texture and extremes of color range.

1.06 QUALITY ASSURANCE - MASONRY WORK

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store materials in covered, well-ventilated area protected from exposure to detrimental conditions, including airborne contaminants, dirt, dust, sunlight, temperatures lower than 40 degrees F or greater than 100 degrees F, rainfall, sparks, or flame, and in accordance with the manufacturer's requirements. Store polymer resins and hardeners in separate area from construction materials that can absorb odors.

1.08 FIELD CONDITIONS - MASONRY WORK

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Do not blast clean or use process creating dust, dirt, when wind is over 10 mph.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Restoration and Cleaning Chemicals:

1. PROSOCO; Product Enviro Klean - 2010 All Surface Cleaner: www.prosoco.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MORTAR MATERIALS

A. Comply with requirements of Section 04 0511.

2.03 MASONRY MATERIALS

A. Brick: Section 04 2000.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify that masonry surfaces to receive CFRP are as dry as recommended by CFRP system manufacturer. Evaluate moisture content in accordance with ACI SPEC-548.14.

3.02 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Carefully remove masonry in a saw tooth pattern to allow for seamless installation of new brick.
1. Do not saw cut a straight line to remove brick during demolition unless a control joint or straight line cut is required for other reasons specified elsewhere.

E. Cover existing landscaping with tarpaulins or similar covers.

F. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

G. Close off adjacent occupied areas with dust proof and weatherproof partitions.

H. Protect roof membrane and flashings from damage with 1/2 inch plywood laid on roof surfaces over full extent of work area and traffic route.

I. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

J. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.03 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Tooth in all new masonry into existing wall so there is no evidence of patching when work is complete.

C. Support structure as necessary in advance of cutting out units.

D. Cut away loose or unsound adjoining masonry as directed.

E. Build in new units following procedures for new work specified in other section(s).

F. Mortar Mix: Colored and proportioned to match existing work.

G. Ensure that anchors are correctly located and built in.

H. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.04 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

C. Use hand tools only. Do not use power tools.

D. Do not damage masonry units.

E. When cutting is complete, remove dust and loose material by brushing.

F. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.

G. Moist cure for 72 hours.

3.05 CLEANING EXISTING MASONRY

A. Cleaning Detergent: Brush clean masonry surfaces at all locations locations with cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

3.06 CLEANING NEW MASONRY

A. Verify mortar is fully set and cured.

B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.

C. Scrub walls with non-ionic type cleaning agent solution using stiff brush. Thoroughly rinse and wash off cleaning solution, dirt and mortar crumbs using clean, pressurized water.

D. Before solution dries, rinse and remove acid solution and dissolved mortar, using clean, pressurized water.

3.07 RESTORATION CLEANING

A. Clean all stone surfaces first with a low psi (<1,000 psi) water wash.

B. Mixing: Enviro Klean - 2010 All Surface Cleaner - use at full strength. Dilution up to 3:1 is allowed if area shows no staining remaining on second application.

C. Clean surfaces and remove large particles with wood scrapers.

D. Working from the bottom to the top, apply prepared solution to a dry surface.

E. Leave solution on the surface for 1-10 minutes. If solution begins to dry, reapply.

F. Gently scrub with a brush, heavily soiled areas.

G. Pressure rinse from the bottom of the treated area to the top. Make sure to cover each portion of the masonry surface with a concentrated stream of water. To avoid streaking, keep wall surfaces immediately below area being cleaned running wet and free of cleaner rundown and residues.

H. Provide two applications of cleaner and scrubbing, to match cleaniness of mock-up area.

I. Be sure to allow sufficient time for solution to remain on masonry and agitate with soft fiber brush or sponge.

J. Be sure to rinse from the bottom up with potable water applied at a maximum or 400 psi and at a rate of 4 gal/min.

K. Clean tools and equipment using fresh water.

3.08 CLEANING

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

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

END OF SECTION

SECTION 04 0511
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 0100 - Maintenance of Masonry: Bedding and pointing mortar for masonry restoration work.

B. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

1.03 REFERENCE STANDARDS

A. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.

B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

C. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2024.

D. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.

E. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025.

F. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.

G. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

H. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.

I. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2024a.

J. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 SUBMITTALS

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

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.07 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. Field-mix all mortar and grout.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Mortar Mix Designs: ASTM C270, Property Specification.
   1. Exterior Repointing Mortar: Type N with maximum 2 percent ammonium stearate or calcium stearate per cement weight.

D. Grout Mix Designs:
   1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
      b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.02 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: Color as required to produce approved color sample.

B. Masonry Cement: ASTM C91/C91M.
   1. Type: Type N; ASTM C91/C91M.
   2. Colored Mortar: Premixed cement as required to match Architect's color sample.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.
   1. 44% Sand passing the finest sieve.
   2. 18% Sand passing all the sieves.

E. Grout Aggregate: ASTM C404.

F. 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.

G. Water: Clean and potable.

H. Bonding Agent: Latex type.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

3.03 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:
   1. Limit height of pours to 12 inches.
   2. Limit height of masonry to 16 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 4000 - Quality Requirements.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Concrete Block - Ground Faced.

C. Clay facing brick.

D. Mortar and grout.

E. Reinforcement and anchorage.

F. Flashing and Weep System.

G. Bond Beams and Lintels.

H. Masonry Sealer.

I. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

B. Section 04 0511 - Masonry Mortaring and Grouting.

C. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).

C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.

E. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.

F. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2024.

G. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).

H. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

I. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

J. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

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

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.

D. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Provide Owner additional ground faced concrete block units - 15 of each type, size, style, and color.

1.06 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.

1.07 MOCK-UPS

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Locate where directed.

C. If acceptable mock-up may remain as part of work. If rejected mock-up must be removed and reconstructed unitl approved.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

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. Special Shapes: Provide nonstandard blocks configured for corners.
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
      b. Exposed Faces: Special color and texture, as follows: Ground Face.
      c. Color as selected by Architect from manufacturer's samples.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Color and texture: Match existing color and texture of existing brick on building.
   2. Nominal size: Match existing size of brick on building.
   3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.03 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.04 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.

B. Reinforcing Steel: Type specified in Section 03 3000; size as indicated on drawings; galvanized finish.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss or ladder.
   2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

E. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.

F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.

2.05 FLASHINGS

A. Flashing and Weep System: “BlockFlash” weep system as manufactured by Mortar Net Solutions; 800-664-6638; www.mortarnet.com.
   1. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density Polypropylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar. Attached web covers will span from pan to pan providing protection over the web and the joints of the CMU.
   2. Designed to be built into mortar bed joints to expel moisture (unimpeded by mortar droppings) to the exterior of CMU walls. Drainage Mats and Insect Guards included.

B. Termination Bars: Stainless steel; compatible with membrane and adhesives.

2.06 ACCESSORIES

A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.

B. 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.

C. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.

D. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

E. Masonry Sealer: TK Products - TK-Bright Kure & Seal; 800-441-2129; www.tkproducts.com.
   1. Use TK-00 XYLENE from same manufacturer for clean-up of application tools and equipment.

F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

G. Weeps: As specified with Flashing and Weep System.

H. Cavity Vents:
   1. Type: Extruded propylene with honeycomb design.
   2. Color(s): match mortar.

I. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 LINTELS

A. In Concrete Masonry Unit walls provide Bond Beam Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout.

Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

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.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

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. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Tooth in brick masonry and match existing brick pattern at locations adjacent to masonry installation.
   3. Mortar Joints: Concave.

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, except for units laid in stack bond.

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. Isolate masonry partitions from vertical structural framing members with a control joint.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 FLASHING AND WEEP SYSTEM

A. General: Install in all CMU walls. Provide embedded flashing and weep pan system in masonry at shelf angles, lintels, ledges, other obstructions, and in lowest bed joint of wall to downward flow of water in wall, where indicated and as recommended by manufacturer.

B. Install single-wythe CMU BlockFlash flashing system in bed joints (just above first course) of CMU walls or next bed joint above shelf angles, lintels, ledges, or obstructions to comply with manufacturer's written instructions, available from Mortar Net Solutions, www.mortarnet.com.
   1. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Attached web covers will span from pan to pan providing protection over the web and the joints of the CMU.
   2. One weep spout per cell, typical.
   3. Install the BlockFlash course by spacing units over the cores or cells of each block.
   4. Use the reference lip on bottom of the BlockFlash spout to position the pan against front of foundation or block. The drip edge on the weep spout will extend slightly. Make sure the connector bridges overlap with the next pan. This will divert water into adjoining BlockFlash pans.
   5. Vertical Rebar / Grouted Cells / Corners: Where walls are reinforced, eliminate the BlockFlash pan at the grouted core and detatch the connector bridge from the adjoining pan by bending it back and forth a few times. Use the same technique for corners. Cross web mortar adjacent to the grouted core making sure to overlap the BlockFlash flange. Use the same technique for corners.
   6. Mortar Spreading: Use standard mortar spreading techniques. Cross-web mortar on both sides of the grouted cell to prevent grout from the vertical cell from clogging the adjacent BlockFlash pan.
   7. Drainage: Install one 7” x 16” Drainage Mat in each CMU core in the course directly above the pan course. The Drainage Mat should be installed front and back of CMU cells, not side to side, and should touch both walls of the CMU and the BlockFlash pan. Properly installed Drainage Mats catch and suspend mortar droppings above the pans and provide pathways for water to flow past the droppings to the pans.
   8. Tooling: Tool all head and bed joints and remove any obstruction from the weep spouts.
   9. Ensure integrated Insect Guards (at each weep spout) are included and weep spouts are located and installed per manufacturer’s instructions.

3.07 CAVITY VENTS

A. Install cavity vents in all CMU walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.08 CAVITY MORTAR CONTROL

A. In all CMU walls do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.

3.09 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches.

F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

G. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

H. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.10 LINTELS

A. Install reinforced unit masonry lintels Bond Beams over all openings where steel lintels are not scheduled.

B. Bond Beams as detailed in Structural Drawings.

3.11 MASONRY SEALER APPLICATION

A. Apply to all exposed surfaces of Ground Face Concrete Unit Masonry.

B. Surfaces must be clean, dry, and free of form oils, grease, dust, frost, and curing compounds (particularly wax-based). Large areas may be blown dust free by compressed air, washed, and let dry. Surface water must be allowed to completely dissipate before applying.

C. TK Bright Kure & Seal material is ready for use and requires no mixing or dilution. It is unlawful to further dilute with non-exempt solvents.

D. For the best results, apply with an airless sprayer and back roll. Apply in a uniform manner at the specified application rate, taking care to avoid lap marks. Use natural break points, such as cuts and joints, as stopping points whenever possible. DO NOT OVER APPLY. Note that masonry must be fully cured (looks uniform in color) and dry at the time of application. This eliminates the possibility of moisture becoming trapped between the film and the CMU, resulting in a white haze on the surface. If a white haze does develop, a second application of TK Bright Kure & Seal will emulsify the film and allow trapped moisture to escape. The coating will then be able to re-harden clearly.

E. Use TK-00 XYLENE to clean tools and equipment. Pump solvent through the sprayer to remove residue of materials which can clog the hose and wand assembly.

3.12 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. Install joints at locations as shown on drawings.

3.13 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 CUTTING AND FITTING

A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

3.17 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.18 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 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).

B. AISC 341 - Seismic Provisions for Structural Steel Buildings; 2022.

C. AISC 360 - Specification for Structural Steel Buildings; 2022, with Errata (2025).

D. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2024b.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

G. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

I. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

J. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

K. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.

L. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2024.

M. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.

N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

P. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals; 2024, with Errata (2025).

Q. SSPC-SP 2 - Hand Tool Cleaning; 2024.

R. SSPC-SP 3 - Power Tool Cleaning; 2024.

1.02 SUMMARY

A. Section Includes:
   1. Structural steel.

B. Related Requirements:
   1. Section 05 3100 - Steel Decking for field installation of shear stud connectors through deck.
   2. Section 05 5000 - Metal Fabrications for miscellaneous steel fabrications and other steel items not defined as structural steel.

1.03 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
   1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches.
   2. Welded built-up members with plates thicker than 2 inches.
   3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members indicated as "protected zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand-Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the seismic-load-resisting system and which are indicated as "demand critical" or "seismic critical" on Drawings.

1.04 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment Drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
   5. Identify members and connections of the seismic-load-resisting system.
   6. Indicate locations and dimensions of protected zones.
   7. Identify demand-critical welds.
   8. Identify members not to be shop primed.

1.06 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.07 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:
   1. ANSI/AISC 303.
   2. ANSI/AISC 341.
   3. ANSI/AISC 360.
   4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:
   1. Connection designs have been completed and connections indicated on the Drawings.

2.02 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M [ASTM A572/A572M, Grade 50

B. Channels, Angles M-Shapes, S-Shapes : ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M.

D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.

E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

2.03 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex or round head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
   1. Finish: Plain.

C. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.04 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 3.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.05 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.
   1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates and bearing plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

C. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.05 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:
1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION

SECTION 05 2100
STEEL JOIST FRAMING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

C. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2024.

D. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

G. SSPC-SP 2 - Hand Tool Cleaning; 2024.

H. SSPC-SP 3 - Power Tool Cleaning; 2024.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. This Section includes the following:
   1. K-series steel joists.
   2. Joist accessories.

B. Related Sections include the following:
   1. Division 03 Section - Cast-in-Place Concrete for installing bearing plates in concrete.
   2. Division 04 for installing bearing plates in masonry.

1.04 DEFINITIONS

A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."
   1. Roof Joists: Vertical deflection of 1/360 (for live load), 1/240 (for total load) of the span.

1.05 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated.

B. Shop Drawings: Show layout, designation, number, type, location, and spacing’s of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
   1. Indicate locations and details of bearing plates to be embedded in other construction.
   2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

C. Welding certificates.

D. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.

E. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.

F. Qualification Data: For manufacturer.

G. Field quality-control test and inspection reports.

H. Research/Evaluation Reports: For joists.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."
   1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.08 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.
   1. Recycled Content: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Bearing Plates: ASTM A36/A36M.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
   1. Finish: Plain, uncoated.

D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
   1. Finish: Plain.

E. Welding Electrodes: Comply with AWS standards.

F. Galvanizing Repair Paint: ASTM A 780.

2.02 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

B. Primer: Provide shop primer that complies with Division 09 painting Sections.

2.03 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
   1. Joist Type: KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

D. Provide holes in chord members for connecting and securing other construction to joists.

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Camber joists according to SJI's "Specifications."

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.04 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated.

C. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

D. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.05 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2.

B. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
   1. Before installation, splice joists delivered to Project site in more than one piece.
   2. Space, adjust, and align joists accurately in location before permanently fastening.
   3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
   4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Field welds will be visually inspected according to AWS D1.1/D1.1M.

C. In addition to visual inspection, field welds will be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:
   1. Radiographic Testing: ASTM E 94.
   2. Magnetic Particle Inspection: ASTM E709.
   3. Ultrasonic Testing: ASTM E164.
   4. Liquid Penetrant Inspection: ASTM E 165.

D. Bolted connections will be visually inspected.

E. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

F. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

G. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.04 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, and accessories.
   1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
   2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 3100
STEEL DECKING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2024.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

F. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).

G. SDI QA/QC - Standard for Quality Control and Quality Assurance for Installation of Steel Deck; 2022.

H. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.02 SUMMARY

A. Section Includes:
   1. Roof Deck

B. Related Requirements:
   1. Section 05 1200 - Structural Steel Framing for shop- and field-welded shear connectors.

1.03 ACTION SUBMITTALS

A. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.04 INFORMATIONAL SUBMITTALS

A. Certificates:
   1. Welding certificates.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:
      a. AWS D1.1/D1.1M.
      b. AWS D1.3/D1.3M.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
   1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

2.02 ROOF DECK

A. Swine Barn East Restroom Roof: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
   1. Prime painted Steel Sheet: ASTM A1008/A1008M. Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard backed on, rust inhibitive primer.
      a. Color Owner Specified – Bone White
   2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 G90 zinc coating.
   3. Deck Profile: Type 3NPA20 cellular deck
   4. Profile Depth: 3 inches.
   5. Design Uncoated-Steel Thickness: 20 gage.
   6. Span Condition: simple span .
   7. Side Laps: Overlapped .

B. Cattle Barn Electrical Building Roof: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
   1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 50 G90 zinc coating.
   2. Deck Profile: Type B .
   3. Profile Depth: 1-1/2 inches.
   4. Design Uncoated-Steel Thickness: 22 gage
   5. Span Condition: three span .
   6. Side Laps: Overlapped .

2.03 ACCESSORIES

A. Preformed foam closure inserts at large flute cells for WA Epic Wide Deck – at locations indicated on drawings.

B. Preformed foam closure inserts at flute cells for WR Deck – at all exterior locations.

C. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

D. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

E. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

F. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

G. Galvanizing Repair Paint: ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. .

3.03 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
   1. Weld Diameter: 5/8 inch, nominal.
   2. Weld Spacing:
      a. Weld edge ribs of panels at each support. Space additional welds an average of 16 inches apart, but not more than 18 inches apart.
      b. Space and locate welds as indicated.
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:
   1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.04 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting:
   1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
   2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
   3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 9000 - Painting and Coating.
   4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 09 9000 - Painting and Coating.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 2100 - Steel Joist Framing: Structural joist bearing plates, including anchorage.

D. Section 05 3100 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

I. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

M. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

B. Lintels: As detailed; prime paint finish.

2.03 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.

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.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.04 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 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

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. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

E. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonstructural dimension lumber framing.

B. Rough opening framing for doors, and windows.

C. Sheathing.

D. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

C. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

E. PS 1 - Structural Plywood; 2023.

F. PS 20 - American Softwood Lumber Standard; 2025.

1.04 SUBMITTALS

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

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for materials and workmanship commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
2. 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.
3. 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

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Southern Pine.
   2. Grade: No. 1.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 1 or Construction Grade.
   2. Boards: No. 1.

2.03 CONSTRUCTION PANELS

A. Plywood: Wood structural panels.
   1. Plywood Panels:
      a. Thickness: 5/8-inch unless noted otherwise.
      b. Comply with PS 1.
      c. Bond Classification: Exposure 1.
      d. Grade: BBX, prepare exposed surface for paint.
      e. Sizes: 48 by 96 inches.
      f. Edges: Square.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Fasteners, General: Size and type complying with manufacturer's written instructions for Project conditions and requirements of authorities having jurisdiction.
   3. Corrosion Resistance: Hot-dip zinc coating, ASTM A153/A153M or Type 304 stainless steel.
   4. Nails, Brads, and Staples: ICC AC116 and ICC AC201.
   5. Power-Driven Fasteners: ICC-ES-1539 or NER-272.

B. Sill Gasket on Top of Foundation Wall: 3/8 inch thick, closed-cell plastic foam.
   1. Width: 3-1/2 inches.
   2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

C. Sill Flashing: See Section 07 6200.

D. General Purpose Construction Adhesives: Comply with ASTM C557.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: When required based on location, 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.

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. 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.

D. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

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 framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. 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.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:
   1. Wall brackets and supports.
   2. Grab bars.
   3. Toilet and Custodial accessories.
   4. Wall-mounted door stops.
   5. Wall paneling and trim.
   6. Joints of rigid wall coverings that occur between studs.
   7. Shower Trim.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
   1. Install plywood wall sheathing in accordance with manufacturer's current ICC-ES evaluation report for specified sheathing product.

3.06 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.07 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.09 CLEANING

A. Waste Disposal: See Section 01 5000 Temporary Facilities and Controls.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 8200
COMPOSITE TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. PVC Polyurethane trim.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants.

B. Section 09 9000 - Painting and Coating.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data for base moldings.

C. Shop Drawings: For each type of composite trim, indicate:

D. Samples: For each trim type, two samples, 12 inches by 12 inches in size, indicating specified color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing manufacturing products specified in this section, with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site in original packages, containers or bundles bearing brand name and identification.

B. Store products under cover, elevated above grade, and in dry, well-ventilated areas not exposed to heat or sunlight. Protect from moisture damage.

C. Handle products to prevent damage to edges, ends, or surfaces.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. PVC Polymer Composite Trim:
   1. Royal Corinthian: www.royalcorinthian.com.
   2. Worthington Millwork LLC: www.worthingtonmillwork.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Surface Burning Requirements:
   1. Interior Use: Flame spread index of 75 or less and smoke-development index of 450 or less; Class B interior finish classification when tested in accordance with ASTM E84.

2.03 PVC POLYMER TRIM

A. Polymer Trim: Nonstructural plastic fabrications formed into various trim profiles using resins, fillers, and additives in open-mold processes.

B. Resin: Polyester.

C. Fillers and Additives: As recommended by manufacturer for application.

D. Surface Finishes:
   1. Surface In-Mold Coating: Manufacturer's standard gelcoat surface coating.
   2. Texture: Manufacturer's standard textured finish.
   3. Sheen: Manufacturer's standard.

E. Applications: Door casings.
   1. Threshold low-profile: 1/2-inch high maximum, bevel edges down to be no higher than 1/4-inch.
   2. Edge trim: 3 inch width, 3/8-inch high with square eased edges. Stagger thickness if needed to cover uneven surfaces.

F. Fabrication Tolerances:
   1. Maximum Variation from Dimension Height: 1/4 inch in 10 feet.

2.04 FABRICATION

A. Fabricate and finish units at factory to greatest extent possible in accordance with approved shop drawings.

B. Provide consistent finish over exposed surfaces matching approved samples.

C. Radius corners and edges with 1/4 inch minimum radius; polish exposed edges.

D. Fabricate cutouts where indicated.

2.05 ACCESSORIES

A. General: Accessories recommended by composite trim manufacturer for complete installation.

B. Concealed Fasteners: Threaded fasteners as recommended by composite trim manufacturer; type and size to suit application:
   1. Low Corrosion Risk: Carbon steel with zinc-plated coatings.
   2. No cover or caps are allowed all fasteners must be concealed.

C. Connectors: As recommended by composite trim manufacturer; type and size to suit application:
   1. Low Corrosion Risk: Carbon steel sheet; powder coated.

D. Adhesives: Type recommended by composite trim manufacturer for application; not containing formaldehyde or volatile organic compounds.
   1. Where visible in finished work, tint adhesive to match composite trim exposed surface.

E. Sealants: Sealant recommended by composite fabrications manufacturer.

2.06 FIELD-APPLIED FINISHES

A. Interior Painting of Composite Trim: See Section 09 9000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements are as indicated on shop drawings.

B. Verify substrates are prepared to receive composite trim.

3.02 PREPARATION

A. Prepare substrates in accordance with manufacturer's written instructions.

3.03 INSTALLATION

A. Install composite trim in accordance with manufacturer's written instructions.

B. Install anchoring devices in accordance with composite trim manufacturer's setting templates.

C. Rigidly anchor to substrate to prevent misalignment.

D. Align work plumb and level.

E. Install with concealed fasteners and adhesive. Exposed fasteners are not allowed.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation from Plumb: 1/4 inch in 10 feet.

C. Maximum Variation from Level: 1/4 inch in 10 feet.

3.05 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed surfaces of installed units in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Protect installed composite trim units from subsequent construction operations.

3.07 SCHEDULES

A. Provide low profile PVC Polymer threshold at entrance of prefabricated shower enclosure. Meet ADA requirements for threshold installation.

B. Provide PVC Polymer trim at all exposed edges of prefabricated shower enclosure.

END OF SECTION

SECTION 06 8316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2024.

B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.03 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 2 by 2 inch in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Crane Composites, Inc: www.cranecomposites.com.
   2. Marlite, Inc: www.marlite.com.
   3. Nudo Products, Inc: www.nudo.com.
   4. Panolam Industries International, Inc: www.panolam.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.10 inch.
   3. Surface Design: Embossed.
   4. Color: White.
   5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

3.03 SCHEDULE

A. Locate at Mop Sinks in Rooms Jan 08, Jan 14.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mineral fiber board insulation.

B. Mineral fiber blanket insulation.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Metal stud walls.

B. Section 06 1000 - Rough Carpentry: Wood stud walls.

C. Section 06 1000 - Rough Carpentry: Wall sheathing.

1.03 REFERENCE STANDARDS

A. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations; 2023.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

G. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2025.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

J. EN 15804 - Sustainability of Construction Works - Environmental Product Declarations - Core Rules for the Product Category of Construction Products; 2022 (Corrigendum 2021).

K. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures; 2006.

L. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and accessories in insulation manufacturer’s original packaging with identification labels intact and in sizes to suit project.
   1. Ensure insulation materials are not exposed to moisture during delivery.
   2. Replace wet or damaged insulation materials.

B. Store materials off ground in dry location and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer; store in original packaging until installed.

C. Packaging Waste Management: Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities. Collect and separate for disposal paper and plastic material in appropriate on-site storage containers for recycling.

1.07 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermal Insulation:
   1. ROCKWOOL: www.rockwool.com.
   2. Substitutions: Not permitted.

2.02 MINERAL FIBER BOARD INSULATION MATERIALS

A. Mineral Fiber Board Thermal Insulation: Rigid stone wool, unfaced insulation that is noncombustible, water repellent, fire resistant, and sound absorbent; Type IVB in accordance with ASTM C612.
   1. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.
   2. Smoke Developed Index (SDI): 50 or less, when tested in accordance with ASTM E84 or UL 723.
   3. Facing: Unfaced.
   4. Board Thickness: 4 inches.
   5. Board Size: 24 by 48 inches.
   6. Board Edges: Square.
   7. Thermal Resistance: R-value of 4.2 per 1 inch at 75 degrees F, minimum, when tested in accordance with ASTM C518 or ASTM C177.
   8. Density: 8 pcf, nominal.
   9. Compressive Strength: 439 psf at 10 percent compression, and 1,065 psf at 25 percent compression when tested in accordance with ASTM C165.
   10. Moisture Resistance: Absorption of less than 0.05 percent by volume.
   11. Water Vapor Permeance: 31 perm, maximum, at 1 inch thick when tested in accordance with ASTM E96/E96M, desiccant method.
   12. Metallic Corrosion Resistance: Noncorrosive/passed, when tested in accordance with ASTM C665 for steel, and ASTM C795 for stress corrosion cracking tendency of austenitic stainless steel.
   13. Melting Point: 2,150 degrees F, minimum.
   14. Fungi Resistance: Zero mold growth when tested in accordance with ASTM C1338.

15. Environmental Product Declaration (EPD): Material included on UL-certified EPD in accordance with EN 15804 and ISO 14025; see 01 6000 - Product Requirements for additional information.
16. Products:
    a. ROCKWOOL; COMFORTBOARD 80: www.rockwool.com.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Mineral Fiber Blanket Thermal Insulation: Semi-rigid stone wool insulation that is noncombustible; Type 1 in accordance with ASTM C665.
   1. Applications: Insulation for steel stud and wood stud exterior walls for thermal control and fire protection.
   2. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.
   3. Smoke Developed Index (SDI): 50 or less, when tested in accordance with ASTM E84 or UL 723.
   4. Facing: Unfaced.
   5. Steel Studs: See Section 05 4000.
      a. Blanket Overall Size: 2-1/2 inches thick by 16-1/4 inches wide by 48 inches long, nominal.
      b. Thermal Resistance: R-value of 10 at 75 degrees F, minimum, when tested in accordance with ASTM C518.
   6. Density: Greater than 2 pcf, nominal.
   7. Moisture Resistance: Absorption of less than 0.03 percent by weight.
   8. Metallic Corrosion Resistance: Noncorrosive/passed, when tested in accordance with ASTM C665 for steel, and ASTM C795 for stress corrosion cracking tendency of austenitic stainless steel.
   9. Melting Point: 2,150 degrees F, minimum.
   10. Fungi Resistance: Zero mold growth when tested in accordance with ASTM C1338.
   11. Environmental Product Declaration (EPD): Material included on UL-certified EPD in accordance with EN 15804 and ISO 14025; see 01 6000 - Product Requirements for additional information.
   12. Low-Emitting VOC Material Certification: Greenguard Gold certified and listed in UL (GGG).
   13. Products:
       a. ROCKWOOL; COMFORTBATT: www.rockwool.com.

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 honeycombs, fins, or irregularities.

3.02 INSTALLATION

A. Install insulation in accordance with manufacturer’s written installation instructions.

B. Ensure that insulation installation maintains continuity of thermal protection to building interior spaces.

C. Do not compress insulation to fit into spaces.

D. Secure with wire ties when installing between ceiling joists rafter installation

E. Install insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

F. Install insulation at least 3 inches from heat-emitting devices such as recessed light fixtures, and at least 2 inches from sidewalls of chimneys and vents.

3.03 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

B. Open door or window to ensure good ventilation during installation on construction site.

C. Cover open ventilation ducts to reduce passage of particulate into ductwork.

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.

C. Vapor retarder.

D. Cover boards.

E. Flashings.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking: Placement of acoustical insulation for deck flutes.

1.03 REFERENCE STANDARDS

A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

D. FM (AG) - FM Approval Guide; Current Edition.

E. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2025).

F. NRCA (RM) - The NRCA Roofing Manual; 2025.

G. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

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

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.

D. Samples for Verification: Submit two samples 6 by 6 inches in size illustrating membrane, cover board, insulation, and vapor barrier.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this section with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.

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.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 80 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

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.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within five years after installation.

C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.
   3. Exceptions are not Permitted:
      a. Damage due to roof traffic.
      b. Damage due to wind speed greater than 56 miles per hour but less than 90 miles per hour.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
   1. Carlisle SynTec Systems; Sure-Weld TPO: www.carlisle-syntec.com.
   2. Elevate; UltraPly TPO Membrane: www.holcimelevate.com.
   3. GAF; EverGuard Extreme TPO 60 mil: www.gaf.com.
   4. Johns Manville; JM TPO - 60 mil: www.jm.com.
   5. Mule-Hide Products Co, Inc; Standard TPO: www.mulehide.com.
   6. Versico Roofing Systems; VersiFleece RL TPO RapidLock Membrane: www.versico.com.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation:
   1. BASF Corporation; BASF Neopor GPS: www.neopor.basf.us.
   2. Carlisle SynTec Systems; SecurShield Insulation: www.carlisle-syntec.com.
   3. Johns Manville; ENRGY 3 - Flat and Tapered: www.jm.com.
   4. Versico Roofing Systems; SecurShield Insulation: www.versico.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

C. Cover Boards:
   1. Blue Ridge Fiberboard: www.blueridgefiberboard.com.
   2. Johns Manville; SeparatoR CGF: www.jm.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing Assembly Requirements:
   1. Factory Mutual Classification: Class 1 and windstorm resistance of 1-90, in accordance with FM DS 1-28.
   2. Insulation Thermal Resistance (R-Value): 5.6 per inch, minimum; provide insulation of thickness required.

C. Acceptable Insulation Types - Constant Thickness Application:
   1. Minimum 2 layers of polyisocyanurate board.

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:
      a. Adhered Application: Limit width to 120 inches, maximum, when ambient temperatures are less than 40 degrees F for extended period of time during installation.
   3. Color: White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
   1. Fire-retardant adhesive.
   2. Products:
      a. GAF; GAF SA Vapor Retarder XL: www.gaf.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

D. Flexible Flashing Material: Same material as membrane.

E. Through-Wall Flashing: Cold-applied, self-adhering, styrene-butadiene-styrene (SBS) modified rubberized asphalt sheet membrane bonded with high density cross-woven polyethylene film.
   1. Thickness: 47 mil, 0.047 inch, minimum.
   2. Width: 12 inches, minimum.
   3. Products:
      a. IKO Industries, Inc; AquaBarrier TWF: www.iko.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

F. Through-Wall Flashing with Termination Bar: At least 40 mil, 0.040 inch thick poly-reinforced membrane with extruded termination bar and drip-edge.
   1. Width: 18 inches, minimum.

2.04 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 5/8 inch, Type X, fire-resistant.
   2. Products:
      a. Georgia-Pacific; DensDeck: www.densdeck.com.
      b. Georgia-Pacific; DensDeck Prime with EONIC Technology: www.densdeck.com.
      c. Georgia-Pacific; DensDeck StormX with EONIC Technology: www.densdeck.com.

d. Gold Bond Building Products, LLC provided by National Gypsum Company; DEXcell Glass Mat Roof Board: www.goldbondbuilding.com.
e. Gold Bond Building Products, LLC provided by National Gypsum Company; DEXcell FA Glass Mat Roof Board: www.goldbondbuilding.com.
f. Substitutions: See Section 01 6000 - Product Requirements.

2.05 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
1. Classifications:
a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
2) Compressive Strength: Classes 1-2-3, Grade 1, 16 psi (110 kPa), minimum.
3) Thermal Resistance, R-value: 5.6 per inch.
2. Board Size: 48 by 96 inches.
3. Board Thickness: 2.0 inches.
4. Board Edges: Square.
5. Products:
a. GAF; EnergyGuard Polyiso Insulation: www.gaf.com.
b. Johns Manville; ENRGY 3 - Flat and Tapered: www.jm.com.
c. Mule-Hide Products Co, Inc; Poly ISO Flat: www.mulehide.com.
d. Versico Roofing Systems; SecurShield Insulation: www.versico.com.
e. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORIES

A. Vapor Barrier - Separation Sheet: Sheet polyethylene; 6 mil, 0.006 inch thick.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C.

D. T-Joint Patch: Flexible, non-reinforced TPO - to seal seam laps where perimeter and/or header sheets intersect.

E. Cover Tape: 30mil minimum thick, non-reinforced TPO membrane with factory applied peel and stick adhesive tape - to strip in metal flanges..

F. Universal Corners: Flexible, non-reinforced TPO - designed in a waffle pattern for easy installation around inside and outside corners.

G. Single Ply Sealing Mastic: to seal single ply membranes to terminations and other penetrations.

H. Edge Sealant: to seal cut edges of TPO membrane.

I. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

J. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

K. Membrane Adhesive: As recommended by membrane manufacturer.

L. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

M. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

N. Insulation Adhesive: As recommended by insulation manufacturer.

O. Fasteners for roof edge:

1. Fasteners and plates, General: Size and type complying with manufacturer's written instructions for Project conditions and requirements of authorities having jurisdiction.
    a. Corrosion Resistance: Hot-dip zinc coating, ASTM A153/A153M or Type 304 stainless steel.

P. Sealants: As recommended by membrane manufacturer.

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 cant strips are in place.

3.02 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.

3.03 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.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation:
    1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and FM DS 1-28 Factory Mutual requirements.
    2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.

D. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

E. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.

F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

G. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

H. Do not install more insulation than can be covered with membrane in same day.

3.04 INSTALLATION - MEMBRANE

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate at rate of 60 square feet per gallon. 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.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Coordinate installation of roof drains and related flashings.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Owner will provide testing services, and Contractor to provide temporary construction and materials for testing in accordance with requirements.

C. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

3.06 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.

3.07 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, exterior penetrations, other items indicated on drawings, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products; 2018.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

E. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2023).

F. CDA A4050 - Copper in Architecture - Handbook; current edition.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

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

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.05 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. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

2.02 PREPAINTED, METALLIC-COATED STEEL SHEETS

A. Comply with ASTM A755/A755M.

B. Metallic-Coated Steel Sheet Substrates:
   1. Zinc-Coated, Galvanized, Steel Sheets: Commercial steel sheets, galvanized by hot-dip process; comply with ASTM A653/A653M; coating designation G90.

C. Substrate Preparation for Prefinishing: Clean and prepare substrate surfaces in accordance with coating manufacturer's recommendations for substrate type and application.

D. Washcoats or Backercoats: Provide washcoats or backercoats in accordance with organic coating manufacturer's recommendations.

E. Primer Coats: Provide basecoat primers in accordance with coating manufacturer's recommendations for substrate type, topcoat, and application.

F. High-Performance Organic Coating System: Provide thermally cured, 50-percent PVDF or silicone-modified polyester systems in accordance with AAMA 2604; tested for weathering for 5 years with 5 delta units maximum of color change.

G. Color: Galvalume Finish.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.04 GUTTERS AND DOWNSPOUTS

A. Gutters: Profile as indicated .

B. Downspouts: Rectangular profile Open Faced. Sized to fit Gutters.

C. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Straps.
   3. Downspout Supports: Brackets.

D. Seal metal joints.

2.05 FLASHING

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

B. Polyvinyl butyral lead or copper replacement flashing with recycled safety foil glass, 118-mil, 0.118-inch thick roll in accordance with ASTM D1876.
   1. Products:

2.06 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Comply with SMACNA drawing details and narratives as shown in the Architectural Sheet Metal Manual - Seventh Edition.
   1. For the following elements - Copings, Parapet Caps, Sills, Fascias, Flashings, Gutters, Downspouts, Drip Edges, Counterflashings, and Miscellaeous Trim.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Solder metal joints for full metal surface contact, and after soldering wash metal clean with neutralizing solution and rinse with water.

F. Secure gutters and downspouts in place with concealed fasteners.

G. Slope gutters 1/4 inch per 10 feet, minimum.

H. Connect downspouts to storm sewer system, and seal connection watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE

A. Gutters and Downspouts: Gutters shown at 4 locations on new Cattle Barn Building.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

C. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

I. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.03 SUBMITTALS

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

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Backing material recommended by sealant manufacturer.
   4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   5. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

G. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

H. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

I. Manufacturer's qualification statement.

J. Installer's qualification statement.

K. Executed warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver sufficient samples to manufacturer for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Test date.
      b. Copy of test method documents.
      c. Age of sealant upon date of testing.
      d. Test results, modeled after the sample form in the test method document.
      e. Indicate use of photographic record of test.

E. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
   4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
   7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

F. Nondestructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.
   1. Record results on Field Quality Control Log.
   2. Repair failed portions of joints.

G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches long.

2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.
4. Record results on Field Quality Control Log.
5. Repair failed portions of joints.

H. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints:
a. Do not seal exterior joints unless indicated on drawings as sealed.
b. Seal open joints except open joints indicated on drawings as not sealed.
c. Seal the following joints:
1) Wall expansion and control joints.
2) Joints between doors, windows, and other frames or adjacent construction.
3) Joints between different exposed materials.
4) Openings below ledge angles in masonry.
2. Interior Joints:
a. Do not seal interior joints indicated on drawings as not sealed.
b. Do not seal intended gaps and openings in gypsum board and suspended ceilings
c. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
d. Seal open joints except specific open joints indicated on drawings as not sealed.
e. Seal the following joints:
1) Joints between door frames and window frames and adjacent construction.
3. Do Not Seal:
a. Intentional weep holes in masonry.
b. Joints indicated to be covered with expansion joint cover assemblies.
c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
d. Joints where sealant installation is specified in other sections.

B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
2. Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.
3. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.
4. Wiring Slots in Concrete Paving: Self-leveling epoxy sealant.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.
   2. Wall and Ceiling Joints in Wet Areas: Nonsag polyurethane sealant for continuous liquid immersion.
   3. Floor Joints in Wet Areas: Nonsag polyurethane non-traffic-grade sealant suitable for continuous liquid immersion.

D. Interior Wet Areas: Bathrooms, restrooms, and Janitor Closet; fixtures in wet areas include plumbing fixtures, countertops, and other similar items.

2.02 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors: As indicated on drawings.

2.03 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: To be selected by Architect from manufacturer's standard range.
   5. Service Temperature Range: Minus 20 to 180 degrees F.
   6. Products:
      a. Dow; DOWSIL 756 SMS Building Sealant: www.dow.com.
      b. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com.
      c. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: www.dow.com.
      d. Dow; DOWSIL 795 Silicone Building Sealant: www.dow.com.
      e. Pecora Corporation; Pecora 890 NST (Non-Staining Technology): www.pecora.com.
      f. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com.
      g. Sika Corporation; Sikasil WS-290: usa.sika.com.
      h. Sika Corporation; Sikasil WS-295: usa.sika.com.
      i. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com.
      j. Tremco Commercial Sealants & Waterproofing; Spectrem 2: www.tremcosealants.com.
      k. Tremco Commercial Sealants & Waterproofing; Tremsil 200: www.tremcosealants.com.
      l. Tremco Commercial Sealants & Waterproofing; Tremsil 400: www.tremcosealants.com.
      m. Substitutions: See Section 01 6000 - Product Requirements.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Products:
      a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com.
      b. Sika Corporation; Sikasil N Plus US: usa.sika.com.
      c. Sika Corporation; Sikasil GP: usa.sika.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Color: To be selected by Architect from manufacturer's standard range.

3. Service Temperature Range: Minus 40 to 180 degrees F.
4. Products:
    a. Pecora Corporation; DynaTrol II: www.pecora.com.
    b. Pecora Corporation; DynaFlex: www.pecora.com.
    c. Sika Corporation; Sikaflex-1A: usa.sika.com.
    d. Sika Corporation; Sikaflex-2c NS EZ Mix+: usa.sika.com.
    e. Sika Corporation; Sikaflex NP 1: usa.sika.com.
    f. Sika Corporation; Sikaflex NP 2: usa.sika.com.
    g. Tremco Commercial Sealants & Waterproofing; Dymonic 100: www.tremcosealants.com.
    h. Tremco Commercial Sealants & Waterproofing; Vulkem 116: www.tremcosealants.com.
    i. W. R. Meadows, Inc; POURTHANE NS: www.wrmeadows.com.
    j. Substitutions: See Section 01 6000 - Product Requirements.

D. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
1. Movement Capability: Plus and minus 35 percent, minimum.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Service Temperature Range: Minus 40 to 180 degrees F.
4. Products:
    a. Sika Corporation; Sikaflex-1A: usa.sika.com.
    b. Sika Corporation; Sikaflex-2c NS EZ Mix+: usa.sika.com.
    c. Sika Corporation; Sikaflex NP 1: usa.sika.com.
    d. Sika Corporation; Sikaflex NP 2: usa.sika.com.
    e. Substitutions: See Section 01 6000 - Product Requirements.

E. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
3. Products:
    a. Everkem Diversified Products, Inc; EcoTex 25: www.everkemproducts.com.
    b. Everkem Diversified Products, Inc; SilTex 40: www.everkemproducts.com.
    c. Pecora Corporation; AC-20 +Silicone: www.pecora.com.
    d. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com.
    e. Substitutions: See Section 01 6000 - Product Requirements.

F. Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.
1. Products:
    a. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com.
    b. Tremco Commercial Sealants & Waterproofing; Acoustical/Curtainwall Sealant: www.tremcosealants.com.
    c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.

5. Products:
    a. Pecora Corporation: www.pecora.com.
    b. Polycoat Products: www.polycoatusa.com.
    c. Sika Corporation; Sikaflex SL 1: usa.sika.com.
    d. Sika Corporation; Sikaflex SL 2: usa.sika.com.
    e. Sika Corporation; Sikaflex-1c SL: usa.sika.com.
    f. Sika Corporation; Sikaflex-2c SL: usa.sika.com.
    g. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Products:
    a. Sika Corporation; Sikaflex SL 1: usa.sika.com.
    b. Sika Corporation; Sikaflex SL 2: usa.sika.com.
    c. Sika Corporation; Sikaflex-1c SL: usa.sika.com.
    d. Sika Corporation; Sikaflex-2c SL: usa.sika.com.
    e. W. R. Meadows, Inc; POURTHANE SL: www.wrmeadows.com.
    f. Substitutions: See Section 01 6000 - Product Requirements.

C. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Multicomponent, 100 percent solids by weight.
2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
3. Color: To be selected by Architect from manufacturer's standard colors.
4. Joint Width, Minimum: 1/8 inch.
5. Joint Width, Maximum: 1/4 inch.
6. Joint Depth: Provide product suitable for joints from 1/8 inch to 2 inches in depth including space for backer rod.
7. Products:
    a. Adhesives Technology Corporation; CRACKBOND JF-90 HD: www.atcepoxy.com.
    b. Crown Polymers: www.crownpolymers.com.
    c. Dayton Superior Corporation: www.daytonsuperior.com.
    d. Euclid Chemical Company; EUCO 700: www.euclidchemical.com.
    e. Mapei; Mapeiflex Joint Sealant EP 90/50: www.mapei.com.
    f. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
   3. Record each test on Preinstallation Adhesion Test Log as indicated.
   4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.

D. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.

E. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

F. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. See Hardware Schedule.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9113 - Exterior Painting: Field painting.

D. Section 09 9123 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2024.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2024.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

J. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

L. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.

P. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.

Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

1.04 SUBMITTALS

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

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

E. Design Submittals: Manufacturer to submit anchor design analysis calculations for blast-resistant doors signed and sealed by specialty design engineer experienced in this type of work and licensed in the State in which the Project is located.

1.05 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. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
   3. Republic Doors, an Allegion brand: www.republicdoor.com.
   4. Steelcraft, an Allegion brand: www.allegion.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed 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.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Beveled, both sides.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
   7. 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.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) 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 NAAMM HMMA Custom Guidelines: Provide at least A25/ZF75 (galvannealed) for interior applications, and at least A60/ZF180 (galvannealed) or G60/Z180 (galvanized) for corrosive locations.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
      a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
   3. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Door Frames: Knock-down type in existing openings, Full profile/continuously welded type in new construction.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Metal Thickness: 14 gauge, 0.067 inch, minimum.
   3. Frame Finish: Factory primed and field finished.
   4. Weatherstripping: Include on all doors, see Hardware Schedule.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.06 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: As indicated on drawings.
   2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
   3. Metal Finish: match door color polyester powder coating.
   4. Glazing: 1 inch thick, insulated units, tempered, in compliance with requirements of authorities having jurisdiction.

B. Glazing: As specified in Section 08 8000, factory installed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

E. 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.

F. 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

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Hardware Schedule.

1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Comply with glazing installation requirements of Section 08 8000.

F. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 3323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior coiling doors.

B. Electric operators and control stations.

C. Wiring from electric circuit disconnect to operators and control stations.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 26 0583 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

E. ITS (DIR) - Directory of Listed Products; Current Edition.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

H. UL (DIR) - Online Certifications Directory; Current Edition.

I. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

B. Product Data: Provide general construction, electrical equipment, and component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Samples: Two slats, 6 by 6 inches in size illustrating shape, color and finish texture.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for roller shaft counterbalance assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 COILING DOORS

A. Basis of Design: Extruded Aluminum single wall slat coiling door assembly, product AL7-E from QMI Security Solutions.

B. Coiling Door Components:
   1. Slat Type:
      a. Aluminum Single Wall Slats: Extruded aluminum, 6063-T5 alloy. Solid slats with non-slip hinge. Slip hinges with slotted light slits shall not be permitted due to strength compromise.
         1) End Retention: both ends of each slat to contain #8-18 thread 410 stainless steel, Dacromet 320 coated, screws with a 3/16” shoulder bushing and ½” diameter head.
   2. Bottom Base Slat: Extruded aluminum, 6063-T6 alloy. Provide non-latching AL7-L-X-X base slat.
   3. Operation: 110V Motor operated.
      a. Electric Motor operator type: Single phase 110V-60Hz, UL recognized. Motor model / size to be determined by manufacturer to provide ample lift for shutter size and weight.
         1) Optional crank-operated motor override 32:1 gear ratio.
         2) Maintained single switch operation.
   4. End Caps: Die-cast Aluminum square profile. Color to match slats.
   5. Box Cover: Roll formed aluminum; .036 inch thickness, 3105-H14 alloy. Two-piece assembly-profile to match end caps. Color to match slats.
      a. Shape: shall be square.
      b. Size: all shutters for project shall be contained in a maximum 12 inch sized box housing - smaller is preferred. Sizes larger than 12 inches shall not be accepted.
   6. Track Guides/Side Rails: AL7, Aluminum extrusion, 6063-T5, lined with insulation woven polypropylene runners. Color to match slats. Provide manufacturer's standard Security 3”x1” rail for motorized doors.
   7. Mounting: location and details as shown in architectural drawings.
   8. Drive Tube: Manufacturer selected based on shutter specific load calculations from either 60mm octagon steel, 70mm octagon steel, 4” aluminum round, or 5” aluminum round.

C. Shop Finish:
   1. Side Frames and Track: Electrostatically applied - ESP - paint finish AMAA 2603.
   2. Color: To match slats.
   3. Anodized finish: 201-R1 Clear Acid Etch 15 min Velo.

2.02 MATERIALS

A. Metal Curtain Construction: Interlocking slats.
   1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
   2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
   3. Single Wall Aluminum Slats: Minimum thickness; manufacturer's standard for door size and application, made from ASTM B221 (ASTM B221M), aluminum alloy Type 6063.

B. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.

C. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
   1. Stainless Steel: ASTM A 666, Type 304, rollable temper.

D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.

E. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.

2. Latch Handle: Manufacturer's standard.

2.03 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure:
   3. Motor Rating: 1/3 HP; continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA EN 10250, Type 4.
   7. Opening Speed: 12 inches per second.
   8. Brake: Manufacturer's standard type, activated by motor controller.
   9. Manual override in case of power failure.
   10. See Section 26 0583 for electrical connections.

C. Control Station: Provide standard three button, 'Open-Close-Stop' momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

D. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install track and all shutter components to comply with project shop drawings and manufacturer's installation product approvals.

C. After installation, lubricate, test and adjust shutters to operate properly and free from distortion.

D.

E. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

F. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

G. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

H. Coordinate installation of electrical service with Section 26 0583.

I. Complete wiring from disconnect to unit components.

J. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum doors and frames.

B. Weatherstripping.

C. Door hardware.

1.02 RELATED REQUIREMENTS

A. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.

C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

F. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

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

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 10 x 10 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Designer's qualification statement.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 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.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide 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 MANUFACTURERS

A. Aluminum-Framed Storefronts:
   1. Manko Window Systems, Inc; 2450xpt frame: www.mankowindows.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Entrance Doors:
   1. Manko Window Systems, Inc;150xpt: www.mankowindows.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 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: For 1 inch insulating glazing.
   2. Glazing Position: Centered (front to back).
   3. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   4. Finish: Class I natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   5. 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.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. 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.
   8. 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.
   9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

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. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. 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.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
    1. Glazing Stops: Flush.

B. Glazing: See Section 08 8000.

C. Swing Doors: Glazed aluminum.
    1. Thickness: 2-9/16 inches.
    2. Top Rail: 5 inches wide.
    3. Vertical Stiles: 5 inches wide.
    4. Bottom Rail: 10 inches wide.
    5. Glazing Stops: Square.
    6. Finish: Same as storefront.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.

D. Concealed Flashings: Sheet aluminum, 26 gauge, 0.017 inch minimum thickness.

E. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

F. Sealant for Setting Thresholds: Non-curing butyl type.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: See Section 08 8000.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.06 HARDWARE

A. See Hardware Schedule for components not indicated.

B. For each door, include weatherstripping, sill sweep strip, and threshold.

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 storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.

K. 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 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5200
CLAD WOOD WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood perimeter shims.

B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 SUBMITTALS

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

B. Product Data: Show component dimensions, anchorage and fasteners, and glass.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.

D. Samples: Two samples 6 by 6 inch in size illustrating window frame section, mullion section, and glazing.

E. Operating Hardware: Two samples of each type of operating hardware.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.06 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees Fahrenheit.

B. Maintain this minimum temperature during and after installation of sealants.

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. Manufacturer Warranty: Provide 5-year manufacturer warranty for insulated glass units against seal failure, interpane dusting or misting, and replacement of same. Complete forms in Owner's name and register with manufacturer.

D. Manufacturer Warranty: Provide 2-year manufacturer warranty against defects listed. Complete forms in Owner's name and register with manufacturer or warrantor.

1. Degradation of color finish.
2. Delamination or separation of finish cladding from window member.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum Clad Wood Windows:

1. Pella Corporation; Architect Series Reserve: www.pellacommercial.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CLAD WOOD WINDOWS

A. Aluminum-Clad Wood Double-Hung Windows: Pella Reserve Traditional factory-assembled aluminum-clad wood double-hung windows. Sash shall tilt to interior without removal for cleaning.
   1. Exterior Finish: Metal clad, painted.
   2. Interior Finish: primed and painted.
   3. Color: As selected by Architect from manufacturer's standard range.
   4. Configuration: As indicated on drawings.
   5. Wood Species: Clear pine, preservative treated using treatment type suitable for required finish.
   6. Frame and Sash Members: Mortise and tenon joints. Glue and steel pin joints to hairline fit, weather tight.
   7. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.
   8. Weather Stop Flange: Continuous at perimeter of unit.
   9. Clearances and Shim Spacing: Minimum required for installation and dynamic movement of perimeter seal.
   10. Fasteners: Concealed from view.
   11. Internal Drainage of Glazing Spaces to Exterior: Weep holes.
   12. Insect Screen: Locate on outside of windows.

2.03 COMPONENTS

A. Factory Glazing:
   1. Float Glass: ASTM C1036, Quality 1.
   2. Tempered Glass: ASTM C1048.
   3. Type: Silicone-glazed 11/16-inch dual-seal, tempered insulating glass, clear multi-layer Low-E coated with argon.
   4. Integral Light Technology Glazing and Grilles:
      a. Insulating glass contains non-glare spacer between the panes of glass.
      b. Grid: Adhered to glass on double pane and a metal spacer on triple pane.
      c. Room Side Grilles: 7/8" wide ogee profile that are solid Clear Pine.
      d. Exterior Grilles: Extruded aluminum 7/8" ogee profile. Dimension to match room side grilles.
      e. Bars shall be adhered to both sides of insulating glass with VHB acrylic adhesive tape and aligned with non-glare grid.
      f. Finish: Finish color matches interior and exterior finish colors.

B. Frame:
   1. Select softwood, water-repellent, preservative-treated with EnduraGuard® in accordance with WDMA I.S. 4. EnduraGuard includes water-repellency, three active fungicides and an insecticide applied to the frame.
   2. Interior Exposed Surfaces: Painted Pine with no visible fastener holes.
   3. Exterior Surfaces: Clad with aluminum.
   4. Overall Frame Depth: 5 inches.

C. Sash:
   1. Select woods, water water-repellent, preservative-treated with EnduraGuard in accordance with WDMA I.S. 4. EnduraGuard includes water-repellency, three active fungicides and an insecticide applied to the sash.
   2. Interior Exposed Surfaces: Pine.
   3. Exterior Surfaces: Clad with aluminum, lap-jointed at corners.
   4. Corners: Mortised and tenoned, glued and secured with metal fasteners.
   5. Operable sash tilt to interior for cleaning or removal.
   6. Extruded acrylonitile butadiene styprene glazing flange. Flange is located on top of wood sash members and under exterior aluminum cladding.
   7. Sash Thickness: 1-3/4 inches.

D. Weather Stripping:

1. Foam with 3-mil vinyl skin at frame head and at lower sash bottom rail.
2. Thermal-plastic elastomer with slip-coating set into upper sash for tight contact at checkrail.
3. Secondary polyvinyl chloride (PVC) leaf-type weather strip on bottom sash at sill.
4. Water-stop santoprene wrapped foam at head and sill.
5. Thermal-plastic elastomer bulb with slip coating set into lower sash for tight contact at checkrail.
6. Vinyl-wrapped foam inserted into jambliner or jambliner components to seal to sides of sash.

E. Muntins/Grilles: Grilles permanently installed on outside and inside faces of insulating glass.
1. Pattern: Custom design, see drawings.
2. Bar Width: 7/8 inch.
3. Color: Match interior and exterior of frame.

F. Insect Screens: Extruded aluminum frame with mitered and reinforced corners; screen mesh taut and secure to frame; secured to window with adjustable supports allowing screen removal without use of tools.
1. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's standard mesh.
2. Frame Finish: Baked enamel, color to match window interior color.

G. Fasteners: Stainless steel.

H. Sealant and Backing Materials: See Section 07 9200 of types as indicated.

I. Flashing: Provide related flashings, with necessary anchors and attachment devices.

2.04 HARDWARE

A. Double Hung
1. Balances: Comply with AAMA 902 specification
a. Block-and-tackle balances connected to self-locking shoes with zinc die cast terminals concealed within the frame.
b. Balances are attached to frame and connected to sash with polyester cord.
2. Locking System:
a. Two-piece locking system with lock and keeper historic spoon-style. Single-piece lock ties upper and lower sash together. When removed, lower sash becomes operable.
b. One installed on units with frame width less than 37 inches, 2 locks installed on units with frame width of 37 inches or greater.
3. Sash Lifts:
a. Sash lift furnished for field installation.
b. One sash lift on units with frame width less than 37 inches, 2 sash lifts on units with frame width of 37 inches or greater.
1) Hardware Finish
2) Satin nickel.

2.05 ALUMINUM FINISHES

A. Exterior Finish System: Pella EnduraClad.
1. Exterior aluminum surfaces shall be finished with the following multi-stage system:
a. Clean and etch aluminum surface of oxides.
b. Pre-treat with conversion coating.
c. Top coat with baked-on polyester enamel.

B. Color: To be selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Set sill members and sill flashing in continuous bead of sealant.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

A. Remove protective material from factory finished surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors.

B. Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

E. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

H. GANA (SM) - GANA Sealant Manual; 2008.

I. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

J. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

K. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 SUBMITTALS

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

B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

C. Samples: Submit two samples 10 by 10 inch in size of glass units, showing coloration.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com.
   2. Guardian Glass, LLC: www.guardianglass.com.
   3. Pilkington North America Inc: www.pilkington.com/na.
   4. Saint Gobain North America: www.saint-gobain.com.
   5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com.

B. Obsure or Frosted Glass Manufactures shall be the same as Float Glass Manufacturers.
   1. Provide Obscure or Frosted treatment on number 2 surface of insulated units when scheduled.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. 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.
   3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
      a. Provide with obscure (or frosted) on Surface 2 in insulated units when installed in Aluminum Storefront Swinging Doors.
      b. Provide clear insulated unit glazing when in Hollow Metal Doors.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass.

B. Insulating Glass Units: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Spacer Color: Black.
4. Edge Seal:
    a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
    b. Color: Black.
5. Purge interpane space with dry air, hermetically sealed.

C. Insulating Glass Units: Vision glass, double glazed.
1. Applications: Located at Door Type B.
2. Space between lites filled with air.
3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Glazing Method: Dry glazing method, gasket glazing.

D. Insulating Glass Units: Obscure or Frosted glass, double glazed.
1. Applications: Located at Door Type A.
2. Space between lites filled with air.
3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear, apply Obscure or Frosted on Surface 2.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
5. Total Thickness: 1 inch.
6.

2.05 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of the glazing stop by 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; 5 to 30 cured Shore A durometer hardness; 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 silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Interior Glazed: Set glazing infills on the interior (locked room side of door) of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste, do not mark on obscure (frosted) surface.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Gypsum wallboard.

C. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

D. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2024.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.

H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

I. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

J. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2024.

K. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019 (Reapproved 2024).

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

M. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Include data on metal framing, glass mat faced gypsum board, accessories, and joint finishing system.

D. Product Data: Include manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Samples: Two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:

B. 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. Studs: "C" shaped with knurled or embossed faces.
      a. 20-gauge minimum.
      b. Products:
         1) ClarkDietrich; ProSTUD 20: www.clarkdietrich.com.
         2) Substitutions: See Section 01 6000 - Product Requirements.
   2. Runners: U shaped, sized to match studs.

C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.

2.03 BOARD MATERIALS

A. Impact-Resistant Wallboard:
   1. Application: High-traffic areas indicated.
   2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   6. Glass Mat-Faced Type: Gypsum wallboard, as defined in ASTM C1658/C1658M.
   7. Edges: Tapered.
   8. Glass Mat Faced Products: Noncombustible, moisture-resistant gypsum core encased in a fiberglass face and back that shed water. Provide minimum 20-gauge (0.0296 inch) steel studs, as defined by the Steel Stud Manufacturers Association (SSMA). Non intended for exterior applications or constant exposure to water. Protect from immersion in water and the eroding effects of cascading water. Product is not suitable for use as a substrate for tile in wet areas such as tubs, showers, gang shower and other areas subject to direct water exposure. Refer to Gypsum Association's GA-216 reference guide, or ASTM C840 reference standard for additional installation requirements.
      a. Products:
         1) USG Sheetrock Brand Glass-Mat Panels Mold Tough VHI Firecode X 5/8 in: www.usg.com.
      b. Substitutions: Not permitted.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless otherwise indicated.

B. 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, except as otherwise indicated.
   2. Joint Compound: Setting type, field-mixed.

C. Fasteners and Adhesives: Products recommended by gypsum board manufacturer.
   1. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
   2. Adhesive for Attachment to Wood, ASTM C557 and Metal:

PART 3 EXECUTION

3.01 EXAMINATION

A. 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. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure in all locations.
   2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Plumbing fixtures.
   3. Toilet accessories.
   4. Wall-mounted door hardware.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

D. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.04 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, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

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.

3.05 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 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 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.

1.04 SUBMITTALS

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

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 8 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com.
   2. Certainteed Architectural: www.certainteed.com/ceilings-and-walls.
   3. USG Corporation: www.usg.com/ceilings.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Panels: 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. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Panel Edge: Narrow Reveal Corner Beveled for 9/16-inch Grid.
   5. Color: White.
   6. Products:
      a. Armstrong World Industries, Inc; Ultima: www.armstrongceilings.com.
      b. Certainteed Architectural; Symphony m: www.certainteed.com/ceilings-and-walls.
      c. USG Corporation; Mars Acoustical Panels: www.usg.com/ceilings.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, and splices as required.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

C. Provide from same manufacturer as Acoustical Units.

D. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
   1. Profile: Tee; 9/16 inch wide face.
   2. Construction: Double web.
   3. Finish: White painted.

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. Perimeter Moldings: Same metal and finish as grid.
   1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

D. 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 Height: 6 inches.
   2. Finish: Baked enamel.
   3. Color: White.

E. Touch-up Paint: Type and color to match acoustical and grid units.

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.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. 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.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 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.
   3. Double cut and field paint exposed reveal edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Interior painting and coating systems.

C. Scope:
   1. Finish surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
      a. Interior:
         1) Unglazed brick, as sheduled in Rooms 01, 03, and 06.
         2) Metal: Galvanized Hollow Metal Doors.
         3) Metal: Structural steel and steel exposed to view, joists, trusses, beams, miscellaneous ferrous metal, and Metal Decking.
         4) Wood: Sheathing and PVC trim.
         5) Drywall: Gypsum board walls, and similar items.
   2. Do not paint or finish the following:
      a. Anodized Aluminum.
      b. Ground Faced Concrete Masonry Units.

1.02 REFERENCE STANDARDS

A. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

B. SSPC-SP 2 - Hand Tool Cleaning; 2024.

C. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.03 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Clean-up information.

C. Samples: Submit four paper draw down samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.05 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, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.

C. Paint Materials: Store at a minimum of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.

B. Follow manufacturer's recommended procedures for producing the best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; www.sherwin-williams.com/#sle.

2.02 PAINTINGS AND COATINGS

A. General:
   1. Provide factory-mixed coatings unless otherwise indicated.
   2. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.

B. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.03 PAINT SYSTEMS

A. Unglazed brick.
   1. Latex Systems:
      a. Semi-Gloss Finish High Performance (HP):
         1) 1st Coat: Sherwin-Williams Loxon Concrete and Masonry Primer Sealer, LX02W50 Series: www.sherwin-williams.com/#sle.
            (a) 8 mils wet, 3.2 mils dry per coat.
         2) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 HP Zero VOC Latex Semi-Gloss, B31-1950 Series: www.sherwin-williams.com/#sle.
            (a) 4 mils wet, 1.6 mils dry per coat.

B. Metal: Galvanized.
   1. Latex Systems:
      a. Semi-Gloss High Performance:
         1) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.
            (a) 5 mils wet, 2 mils dry per coat.
         2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series: www.sherwin-williams.com/#sle.
            (a) 2 to 4 mils dry per coat.

C. Metal: Structural steel, joists, trusses, beams, miscellaneous, ferrous metal, and metal decking.
   1. Latex Systems:
      a. Semi-Gloss High Performance:
         1) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.
            (a) 5 mils wet, 2 mils dry per coat.
         2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series: www.sherwin-williams.com/#sle.
            (a) 2 to 4 mils dry per coat.

D. Wood: Sheathing, and trim.
   1. Latex Systems:
      a. Semi-Gloss Finish:

1) 1st Coat: Sherwin-Williams Premium Wall and Wood Primer, B28W8111: www.sherwin-williams.com/#sle.
   (a) 4 mils wet, 1.8 mils dry per coat.
2) 2nd and 3rd Coat: Sherwin-Williams ProClassic Waterborne Acrylic Semi-Gloss, B31 Series: www.sherwin-williams.com/#sle.
   (a) 4 mils wet, 1.3 mils dry per coat.

E. Drywall: Walls, ceilings, gypsum board, and similar items.
   1. Latex Systems:
      a. Semi-Gloss Finish High Performance (HP):
         1) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600: www.sherwin-williams.com/#sle.
            (a) 4 mils wet, 1.5 mils dry per coat.
         2) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 HP Zero VOC Latex Semi-Gloss, B31-1950 Series: www.sherwin-williams.com/#sle.
            (a) 4 mils wet, 1.6 mils dry per coat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to 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 mildew from impervious surfaces by scrubbing with solution of water and bleach. Rinse with clean water and allow surface to dry.

D. Masonry: Remove efflorescence and chalk.

E. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.

F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

H. Wood: Remove dust, grit, and foreign matter. Scrape, sand, and spot prime knots and pitch streaks. Fill nail holes and imperfections with wood filler and sand smooth.

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 written instructions.

C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.

D. Regardless of number of coats specified, apply additional coats until complete hide is achieved.

3.04 PRIMING

A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to top coat manufacturers.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.03 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com.
   2. Fire-End & Croker Corporation: www.croker.com.
   3. Kidde, a unit of United Technologies Corp: www.kidde.com.
   4. Potter-Roemer: www.potterroemer.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com.
   2. Fire-End & Croker Corporation: www.croker.com.
   3. Kidde, a unit of United Technologies Corp: www.kidde.com.
   4. Potter-Roemer: www.potterroemer.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 5 pound.
   3. Finish: Baked polyester powder coat, red color.
   4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.

2. Trim: Rolled, with 1-1/2 x 2-1/2 inch edge size.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

D. Door Glazing: Acrylic plastic, clear, 3/8 inch thick, flat shape and set in resilient channel glazing gasket.

E. Fabrication: Weld, fill, and grind components smooth.

F. Finish of Cabinet Exterior Trim and Door: Baked enamel, White color.

G. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Graphic Identification: Fire Extinguisher - verify standard options of size, spacing and location of letters with architect.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 30 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

3.02 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 22 0500
PLUMBING COMMON WORK RESULTS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the equipment and systems indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Plumbing work shall comply with specification section 230500.

B. In addition to Division 22, Plumbing work shall comply with the following sections:

1. Section 230500 HVAC Common Work Results
2. Section 230529 Pipe Hangers and Supports
3. Section 230553 Mechanical Identification
4. Section 230593 Cleaning and Testing
5. Section 230594 Testing Adjusting and Balancing
6. Section 230719 Piping Insulation

1.3 SUBMITTALS

A. Submittals must be reviewed and approved by the Contractor before submitting to the Engineer.

1.4 REGULATORY AND UTILITY REQUIREMENTS

A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.

B. Contractor is responsible for paying for all fees, permits, and inspections required to complete their work.

C. Contractor shall include all work required to install new and relocate utilities and meters as shown on drawings.

D. Utility work 5’-0” from outside of building is by others, unless shown otherwise.

E. Contractor shall notify Owner of any utility service shutdown 48 hours in advance. This includes water, sanitary, and storm systems.

1.5 SUBSTITUTIONS

A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:

1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.

2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.

3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.

C. Approval

1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.

2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repaired at the sole expense of the Contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

PART 2 - PRODUCTS

2.1 PAINT

A. For indoor applications, use paints and primers that have a VOC content of 250 g/L or less when calculated according established in Green Seal Standard GC-03, Anti-Corrosive Paints.

PART 3 - EXECUTION

3.1 CONCRETE BASES

A. Refer to specification section 230500 HVAC Common Work Results and individual equipment specifications for additional requirements.

END OF SECTION

SECTION 22 0523
PLUMBING VALVES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Plumbing Valves indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. All valves shown on the plumbing drawings.

2. Valves to isolate all plumbing fixture groups.

3. Valves to isolate water heaters and other plumbing equipment.

4. Valves to isolate owner provided equipment.

1.2 REFERENCES

A. Abbreviations

1. IBBM: Iron body, bronze mounted.

2. OS&Y: Outside screw and yoke.

3. WOG: Water, oil, gas.

4. WSP: Working steam pressure.

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions for each valve type.

B. Operation and Maintenance Data: For valves, safety valves, pressure-reducing valves, air vents, vacuum breakers, and meters to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Comply with the most recent version following standards:

a. Safe Drinking Water Act (SDWA) and the associated lead content requirements.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

A. Acceptable Manufacturers (unless specified otherwise)

1. Apollo
2. Conbraco
3. Crane
4. Hammond
5. Milwaukee
6. Nibco
7. Stockham
8. Victaulic
9. Watts
10. HCI Terminator

B. Valve Standardization: Valves from one or more manufacturers may be used, however valves supplied for each specific valve type shall be the product of one manufacturer.

C. Valves shall be first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating.

D. Valve parts of same manufacturer, size and type shall be interchangeable.

E. Valves which use packing shall be capable of being packed when wide open and under full working pressure.

F. Size valves the same size as the piping in which they are installed, unless specified otherwise.

G. Provide extended shafts for all valves installed on insulated piping.

H. Coordinate the end connection type with the piping and other specialties in the systems. Refer to the piping usage schedule for additional requirement. The following are acceptable styles:

1. Solder
2. Mechanical press
3. Threaded
4. Flanged
5. Grooved

I. Provide unions in the system as needed for installation or removal of valves and specialties.

J. Manually operated gate, globe and angle valves shall be of rising stem type, unless otherwise specified.

2.2 CHECK VALVES

A. CK-1: 125 psig WSP, 200 psig WOG, bronze body, brass or bronze trim, horizontal swing, renewable and regrindable. Face discs for cold water service with Teflon.

B. CK-2: 125 psig WSP, 200 psig WOG, bronze body, brass or bronze trim, horizontal swing, renewable and regrindable disc. Face discs for cold water service with Teflon.

2.3 BALL VALVES

A. BV-1: 150 psig WSP, 600 psig WOG, two (2) piece bronze body, full-port, solid blow-out proof 316 stainless steel stem, Teflon seats, 316 stainless steel ball, Teflon seals, corrosion resistant steel lever handles with vinyl grips, and balancing stop.

2.4 BALANCING VALVES

A. Manual Type

1. Acceptable Manufacturers:

    a. Bell & Gossett
    b. Conbraco
    c. Griswold
    d. Nexus
    e. Nibco
    f. Taco

2. All valves to be of bronze body/stainless steel construction with glass and carbon filled TFE seat rings. Valves to have differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT insert and check valve. Valve bodies to have 1/4 inch drain/purge port. Valves to have memory stop and calibrated nameplate.

3. Valves shall be leak-tight at full rated working pressure.

    a. 1/2 to 3 inch: 300 psig at 250° F.
    b. 1/2 to 2 inch: 200 psig at 250° F.

B. Automatic Type

1. Acceptable Manufacturers:

    a. Circuit Solver

2. Valve shall regulate the flow of recirculated domestic hot water based on water temperature entering the valve regardless of system operating pressure. As the water temperature increases the valve proportionally closes dynamically adjusting flow to meet the specified temperature. The valve shall never fully close, even at the desired set point. There is always sufficient bypass flow back to the recirculating pump to prevent overheating or “dead heading” of the pump.

3. The valve shall be set at the factory for the desired return temperature. No field adjustments are required. The following factory temperature set points are available.

   a. 100°F / 105°F / 110 °F / 115°F / 120°F / 125°F / 130°F / 140°F

4. The hot water system temperatures shall have the corresponding hot water recirculation temperatures:

   a. 120°F hot water temp / 105°F hot water circ temp

5. The valve shall stay fully open at approximately 10°F below closing temperature.

6. The assembly shall be available in ½", ¾" and 1"

7. Valve body and all internal components are made with lead free materials with major components constructed of type 303 stainless steel.

   a. Valve rated to 200 PSIG maximum working pressure and 250°F maximum working temperature.

8. Thermal actuator shall be spring loaded and self cleaning, delivering closing thrust sufficient to keep orifice opening free of scale deposits.

9. Install valve in each domestic hot water return piping branch beyond last hot water device in that branch.

10. Balancing valves to be provided with the following accessories as indicated on the drawings:

    a. Check valve
    b. Strainer (20 mesh)
    c. Thermometer
    d. Ball valve (assembly inlet and outlet)

11. Coordinate flow arrow, especially with valves that have an integrated check valve

2.5 SAFETY AND RELIEF VALVES

A. General Requirements: Valves shall be as specified by ASME Code governing manufacture of such valves within scope of their particular usage, i.e., Heating Boilers, Unfired Pressure Valves, etc., shall be tested, rated and listed, unless otherwise specified. Valves for applications specified shall conform to the ASME Code, Section IV, Heating Boilers and the following:

1. Valves for combination domestic hot water heater and storage tanks shall conform to the requirements of ASME Code, Section IV and USA Standard Z21.22 and shall be NBB listed. Valves shall be of the temperature - pressure type. Thermostatic element shall, on rising temperature, cause the valve to open at 200° F and valve shall deliver its rated capacity at 210° F and close drip tight at 195° F. Valves shall be sized in accordance with Unfired Vessel Code.

2. End Connections: Unless otherwise specified, safety valves, relief valves and safety relief valves, in sizes 3/4 inch to 3 inches IPS inclusive, may be furnished with male or female pipe thread inlet and female pipe thread outlet; valves over 3 inches IPS must be furnished with 125 lb. or 250 lb. inlet and may be equipped with 125 lb. outlet.

2.6 GAUGE COCKS

A. Acceptable Manufacturers:

1. Marsh Instrument Company
2. Mueller Instruments Co.
3. H.O. Trerice Co.
4. Weksler Instruments Corp.

B. Gauge Cocks: All brass construction, “T” or lever handles, built for 300 psig hydraulic pressure.

2.7 STRAINERS

A. Acceptable Manufacturers:

1. Zurn
2. Watts

B. All strainers to be of constructed of lead free brass, bronze, or copper and shall be rated for use in potable water systems and shall meet the requirements of NSF/ANSI 372. Strainers shall include 20 mesh stainless steel strainer screen and tapped access cover and pipe plug.

2.8 HEAT TRAP FITTING

A. Acceptable Manufacturers

1. Rheem/Ruud
2. Prior approved equal

B. Dielectric nipple-style heat trap to prevent heat loss through top water heater storage tank connections. Plastic ball flow control with inert thermoplastic lining for anti-corrosion. Heat trap fitting shall be factory-marked (color coded or flow direction stamped) for hot and cold installations. Ball seat to allow for thermal expansion bypass.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install valves at locations noted on the drawings or specified.

1. Install shutoffs for branch lines to each group of fixtures.
2. Install shutoff valves above ceiling for each fixture if fixture is not provided with integral stops.

3.2 VALVE APPLICATION SCHEDULE

A. Schedule of valve applications for the different services is as follows:

1. Cold Water, Domestic Hot Water and Circulating (CW, HW, HWC) located inside building, 125 psig and Less:

a. 3 inch and Less: BV-1, CK-1, CK-2.

END OF SECTION

SECTION 22 1100
PLUMBING PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Plumbing Piping Systems indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in this section:

1. Cold Water
2. Hot Water
3. Hot Water Recirculation
4. Sanitary
5. Vent
6. Water Service

1.2 REFERENCES

A. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. The adopted version of the Uniform Plumbing Code shall be applicable to this Project unless identified by a specific edition date.

1.3 SUBMITTALS

A. Product Data

1. Catalog sheets and specifications indicating manufacturer name, pipe/fitting type, applicable reference standard, schedule, or class for specified pipe and fittings.
2. Material Schedule: Itemized pipe and fitting material list for each specified piping application in Pipe and Fittings Schedule as defined in Part 3 of this specification section. Where optional materials are specified indicate option selected.

B. Submit piping layout drawings as per specification section 230500 HVAC Common Work Results.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Comply with the most recent version following standards:

   a. Safe Drinking Water Act (SDWA) and the associated lead content requirements.

2. Use only materials and methods allowed by applicable codes and authority having jurisdiction (AHJ). It is the contractor's responsibility to confirm if plastic piping is acceptable with the AHJ prior to installation.

B. Qualification of Brazers

1. Comply with the following: The persons performing the brazing and their supervisors shall be personally experienced in brazing procedures.

1.5 EXTRA MATERIALS

A. Provide new manual pipe cutting and crimp ring tools for PEX piping. Crimping tool shall be capable of crimping joints for all sizes of piping installed on job. Tools shall be same as pipe manufacturer. Tools shall include instructions.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Steel Pipe for Threading: Standard weight, Schedule 40, black; ASTM A 53 or ASTM A 135.

B. Steel Pipe for Roll Grooving: Standard weight, Schedule 40, black; ASTM A 53, Grade B, Type F for sizes 3/4" to 1-1/2", and Type E or S for sizes 2" to 24", or ASTM A 135.

C. Malleable Iron, Steam Pattern Threaded Fittings

1. 150 lb Class: ASME B16.3.

2. 300 lb Class: ASME B16.3.

D. Cast Iron Fittings

1. Drainage Pattern, Threaded: ASME B16.12.

2. Steam Pattern, Threaded: ASME B16.4.

   a. Standard Weight: Class 125.
   b. Extra Heavy Weight: Class 250.

3. Flanged Fittings and Threaded Flanges: ASME B16.1.

   a. Standard Weight: Class 125.
   b. Extra Heavy: Class 250.

E. Unions: Malleable iron, 250 lb class, brass to iron or brass to brass seats.

F. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.

G. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

2.2 COPPER AND BRASS PIPE, TUBING AND FITTINGS

A. Copper Tube, Types K and L: ASTM B 88.

B. Wrought Copper Tube Fittings, Solder Joint: ASME B16.22.

C. Cast Copper Alloy Tube Fittings, Solder Joint: ASME B16.18.

D. Drainage Tube, Type DWV: ASTM B 306.

E. Wrought Copper Drainage Tube Fittings, Solder Joint: ASME B16.29.

F. Cast Copper Alloy Drainage Fittings, Solder Joint: ASME B16.23.

G. Chrome Plated Grade A Red Brass Threaded Pipe, Standard Weight: ASTM B 43.

1. Plating: 0.02 mil chromium over 0.2 mil nickel plating, high polish finish.

H. Unions: Cast bronze, 150 lb Class, bronze to bronze seats, threaded or solder joint.

I. Flared Tube Fittings

1. Water Tube Type: ASME B16.26.

J. Flanges: Conform to the Standards for fittings used in systems.

1. Brazing Flanges: ASME B16.24, hubs modified for brazing ends.

K. Mechanical Press Fittings

1. Copper with EPDM seals; ANSI B-16.22, NSF-61.

2.3 CAST IRON PIPE AND FITTINGS

A. Bell and Spigot Soil Pipe: Service Weight, Bitumin coated; ASTM A 74, CISPI/NSF. All pipes shall be marked with CISPI and NSF listing.

B. Bell and Spigot Soil Pipe Fittings: Service Weight, Bitumin coated; ASTM A 74, CISPI/NSF.

C. Bell and Spigot Soil Pipe Gaskets: ASTM C564

D. Hubless Pipe: Bitumin coated; CISPI Standard No. 301. All pipes shall be marked with CISPI and NSF listing.

E. Hubless Pipe Fittings: Drainage Pattern, Bitumin coated; CISPI No. 301.

F. Hubless Joint Couplings: Stainless steel shield and clamp assembly, and elastomer sealing sleeve; CISPI-310.

2.4 DUCTILE IRON PIPE AND FITTINGS

A. Water Pipe: Bitumin coated and cement-mortar lined; AWWA C151.

1. 3"- 4": Class 51.

2. 6" and Over: Class 50.

B. Fittings: Bitumin coated and cement-mortar lined; AWWA C110.

2.5 COUPLINGS AND FITTINGS FOR GROOVED END PIPE

A. Couplings: Gruvlok Fig. 7401 or 74, or Victaulic Co.'s Style 07 or 107, having minimum pressure rating of:

1. 750 psi from 1-1/2" to 4"

2. 700 psi for 6"

3. 600 psi for 8"

B. Couplings: Gruvlok Fig. 7001, or Victaulic Co.'s Style 77, having pressure rating of:

1. 1000 psi for 3/4" to 6"

2. 800 psi for 8" to 12"

3. 300 psi for 14" to 24"

C. Fittings: By same manufacturer as couplings, having pressure ratings equal to or greater than couplings. Comply with the following standards:

1. Steel: ASTM A 53 or A 106, Grade B.

2. Malleable Iron: ASTM A 47.

3. Ductile Iron: ASTM A 536.

2.6 PVC PIPING AND FITTINGS

A. Pipe: Schedule 40 PVC , Type I, rated for 140° F, ASTM D2665

B. Fittings: Same as pipe manufacturer; ASTM D2466. Solvent welded using solvent approved by manufacturer.

C. with ASTM D 2321 and ASTM F 1668.

2.7 JOINING AND SEALANT MATERIALS

A. Thread Sealant

1. LA-CO Industries', Slic-Tite Paste with Teflon.

2. Loctite Corp.'s No. 565 Thread Sealant.

3. Thread sealants for potable water shall be NSF approved.

B. Solder: Solid wire type conforming to the following:

1. Lead-free tin-silver solder (ASTM B 32 Alloy Grade E, AC, or HB)

C. Brazing Alloys

1. Type 1: AWS A5.8, Class BCuP-5, for brazing copper to brass, bronze, or copper.

2. Type 2: AWS A5.8, Class BAg-7, for brazing copper to steel or stainless steel.

D. Brazing Flux: FS O-F-499, Type B.

E. Gaskets For Use With Ductile Iron Water Pipe and Cast Iron Drainage Pipe: Synthetic rubber rings (molded or tubular): Clow Corp.'s Belltite, Tyler Pipe Industries Inc.'s Ty-Seal, or U.S. Pipe and Foundry Co.'s Tyton.

F. Flange Gasket Material

1. For Use With Cold Water: 1/16" thick rubber.

2. For Use With Hot Water, Air or Steam: Waterproofed non-asbestos ceramic or mineral fiber, or a combination of metal and water-proofed non-asbestos ceramic or mineral fiber, designed for the temperatures and pressures of the piping systems in which installed.

G. Gaskets For Use With Grooved End Pipe and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.

H. Anti-Seize Lubricant: Bostik Inc.'s Never Seez or Dow Corning Corp.'s Molykote 1000.

2.8 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS

A. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc.

B. Mechanical Modular Seals: Thunderline Corp.'s Link Seal wall and floor seals designed for the service of piping system in which installed.

2.9 DIELECTRIC CONNECTORS

A. Use for all connections between piping connections of dissimilar materials.

B. Unions

1. Rated 250 psig at 180° F; ASME B16.39; Wilkins Model DU.

2. Rated 100 psig at 210° F; ASME B16.39; Wilkins Model DU with high temperature gasket.

3. Rated Above 100 psig and 210° F: Use Flange Electrical Insulation Kit specified below.

C. Flange Electrical Insulation Kit: Consisting of dielectric sleeves and washers, and dielectric gasket.

1. Rated 150 psi at 250° F: ANSI Class 150, full faced neoprene gasket with bolt holes, double phenolic washers, and Mylar sleeves; Model 150 by APS, Lafayette, LA.

2.10 PIPE SLEEVES

A. Install pipe sleeves as noted on the drawings or indicated in this specification section. The following piping material shall be used as noted in the installation section in this specification:

1. Type A: Schedule 40 steel pipe.

2. Type B: No. 16 gauge galvanized sheet steel.

3. Type C: Schedule 40 steel pipe with 1/4" steel collar continuously welded to pipe sleeve. Size steel collars as required to span a minimum of one (1) cell or corrugation, on all sides of the rough opening thru the metal deck.

4. Type D: No. 16 gauge galvanized sheet steel with 16 gauge sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one (1) cell or corrugation, on all sides of the rough opening thru the metal deck.

2.11 PIPING ESCUTCHEONS

A. Cast Brass: Polished chrome plated finish, with set screw.

B. Cast Iron: Solid type, unplated, with set screw; Model 395 by Grinnell Corp.

2.12 THERMOMETERS

A. Acceptable Manufacturers

1. Weiss Instruments

2. Prior Approval

B. Bi-Metal Thermometers

1. Body: Type 304 Stainless Steel, heavy glass face, and hermetically sealed.

2. Bimetallic Element: Bimetallic element calibrated to meet temperature standards of manufacturer and helix assembly with silicon dampening.

3. Stem: Stainless steel to match body and of a length to suit installation. Bare stem shall be used for hydronic systems in non-corrosive applications.

4. Connector: ¾ inch, with ASME B1.1 screw threads.

5. Accuracy: Plus or minus 1 percent of scale range or one scale division, to maximum of 1.5 percent of scale range.

6. See piping application schedule for thermometer range requirements based on system type.

C. Liquid in Glass Thermometers

1. Body: Molded plastic with variable angle mounting compliant with ASME B40.200.

2. Tube: Glass with magnifying lens, blue organic liquid, nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.

3. Stem: Aluminum or brass and of a length to suit installation. Bare stem shall be used for hydronic systems in non-corrosive applications.

4. Connector: ¾ inch, with ASME B1.1 screw threads.

5. Accuracy: Plus or minus 1 percent of scale range or one scale division, to maximum of 1.5 percent of scale range.

6. See piping application schedule for thermometer range requirements based on system type.

D. Digital Thermometer

1. Body: Molded plastic with variable angle mounting.

2. Stem: Aluminum or brass and of a length to suit installation. Bare stem shall be used for hydronic systems in non-corrosive applications.

3. Connector: ¾ inch, with ASME B1.1 screw threads.

4. Display: Digital

5. Accuracy: Plus or minus 2 deg F.

6. Provide thermowell compatible with thermometer based on pipe diameter and system of installation.

7. See piping application schedule for thermometer range requirements based on system type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Piping shall be stored to prevent debris from entering the piping. This shall consist of piping caps or temporary covers.

B. Above or below grade piping that is roughed in shall have a temporary cap installed to prevent debris from entering the piping system. The cap shall be removed to allow for the final connection or continuation of piping to be installed.

C. Install piping at approximate locations indicated, and at maximum height.

D. Install piping clear of door swings, and above sash heads.

E. Make allowances for expansion and contraction.

F. Allow for a minimum of 1” free air space around pipe or pipe covering, unless otherwise specified.

G. Install all underground piping outside the footprint of the building to meet the minimum cover and distance below the frost depth requirements listed below:

1. Sanitary and Storm – 48” minimum cover (below frost depth)

2. Domestic water service – 12” below frost depth of the local jurisdiction or 60” deep, whichever is greater.

H. Install horizontal piping with a constant pitch, and without sags or humps.

1. Water Piping: Pitch 1/4" per 10 feet upward in direction of flow, unless otherwise noted. If it is not possible to maintain constant pitch, establish a new low point and continue. At the low point, provide a 1/2" drip leg and gate valve with a hose bibb end. Provide an air vent at the high point.

2. Sanitary Piping: Pitch piping 3” and Under 1/4" per foot downward, in direction of flow, unless otherwise noted. Pitch piping 4” and Over 1/8” per foot downward, in direction of flow, unless otherwise noted.

3. Vent Piping: Pitch 1/8" per foot upward, unless otherwise noted.

4. Storm Piping: Pitch piping 1/8” per foot downward, in direction of flow, unless otherwise noted.

I. Install vertical piping plumb.

J. Use fittings for offsets and direction changes, except for Type K soft annealed copper temper water tube, and mechanically extracted joints in Type L copper tubing.

K. Cut pipe and tubing ends square; ream before joining.

L. Threading: Use American Standard Taper Pipe Thread Dies.

1. Thread brass pipe with special brass threading dies.

3.2 DRAINAGE SYSTEMS

A. Fittings

1. Long Sweep Fittings

a. Long sweep fittings shall be those in the category where 4” diameter piping has a minimum R/D = 10.5”/4”.
b. Use long sweep drainage pattern fittings for all fittings unless noted otherwise.
c. Use of other fittings must be approved by Engineer in writing prior to use.

2. Short Sweep Fittings

   a. Short sweep fittings shall be those in the category where 4" diameter piping has a minimum R/D = 7.5"/4".
   b. Short sweep drainage pattern fittings may be used for the following.
      1) Vent piping.
      2) Fixture connections.
      3) Other locations as approved by the Engineer in writing.

3. Vertical Offsets: Make vertical offsets with 45° elbows, or 1/8 bends.

B. Cleanouts

1. Install cleanouts with sufficient side and end clearance to allow for the removal of the cleanout plug, and the use of cleaning tools.

2. Lubricate cleanout plugs with anti-seize lubricant.

3.3 DOMESTIC WATER PIPING SYSTEM

A. Connect branch lines to the upper quadrant of the main, and run upward at not less than 45° before extending laterally.

B. Make final connections to plumbing fixtures and equipment with unions, or flanges.

1. Do not use unions in ferrous piping larger than 3".

2. Do not use unions in brass or copper piping larger than 2-1/2".

3.4 PIPE JOINT MAKE-UP

A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with manufacturer's printed application instructions for the intended service.

1. Chrome Plated Brass Pipe: Tighten joint with a strap or Parmalee wrench; do not mar pipe finish. Install piping so that no threads are visible.

B. Soldered Joint: Thoroughly clean tube end and inside of fitting with emery cloth, sand cloth, or wire brush. Apply flux to the pre-cleaned surfaces. Install fitting, heat to soldering temperature, and join the metals with type of solder specified. Remove residue.

C. Flanged Pipe Joint

1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.

2. Provide a gasket for each joint.

   a. Hot Water Pipe Gasket: Coat with a thin film of oil before making up joint.

3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.

D. Caulked Joint: Pack hub with joint packing specified, and caulk. Run 12 ounces molten lead for each inch of pipe diameter. Caulk cooled lead ring and face off smoothly.

E. Rubber Ring Push-on Joint: Clean hub, bevel spigot, and make up joint with lubricated gasket in conformance with the manufacturer's printed installation instructions.

F. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions.

1. Cut grooved end piping is not acceptable.

G. Hubless CI Pipe Joint: Make up joint with hubless fitting and couplings, in conformance with the manufacturer's printed installation instructions.

H. Mechanical Joint: Make up joint in conformance with the manufacturer's printed installation instructions, with particular reference to tightening of bolts.

I. Mechanical Press Joint: Install joint with tool approved by joint manufacturer. Installer shall be fully trained and have experience in installing this type of joint.

J. Dissimilar Pipe Joint

1. Joining Bell and Spigot and Threaded Pipe: Install a half coupling on the pipe or tube end to form a spigot, and caulk into the cast iron bell.

2. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.

3. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.

3.5 PIPING PENETRATIONS

A. Install pre-manufactured flexible boots for vent terminations through roof. Use materials compatible with roof system.

B. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

	CONSTRUCTION	SLEEVE TYPE
1.	Frame construction.	None Required
2.	Foundation walls.	A*
3.	Non-waterproof interior walls.	B*
4.	Non-waterproof interior floors on metal decks.	D*
5.	Non-waterproof interior floors not on metal decks.	B*
6.	Floors not on grade having a floor drain.	A
7.	Floors over mechanical equipment, steam service, machine, and boiler rooms.	A
8.	Floors finished or to be finished with latex composition or terrazzo, and on metal decks.	D*
9.	Floors finished or to be finished with latex composition or terrazzo, and not	A

on metal decks.

10.	Earth supported concrete floors.	None Required		
11.	Exterior concrete slabs on grade.	A		
12.	Fixtures with floor outlet waste piping.	None Required		
13.	Metal roof decks.			C
14.	Non-metal roof decks.			A
15.	Waterproof floors on metal decks.	D		
16.	Waterproof floors not on metal decks.	A		
17.	Waterproof walls.			A

*Core drilling is permissible in lieu of sleeves where marked with asterisks.

C. Diameter of Sleeves and Core Drilled Holes

1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.

2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:

   a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2" greater than outside diameter of pipe, unless otherwise specified.
   b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2" greater than outside diameter of insulation, unless otherwise specified.
   c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.

D. Length of Sleeves (except as shown otherwise on Drawings)

1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.

2. Floors, Finished: Equal in length to total finished thickness of floor and extending 1/2" above the finished floor level, except as follows:

   a. In furred spaces at exterior walls, extend sleeve 1" above the finished floor level.

3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2" above the concrete slab.

4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

E. Packing of Sleeves and Core Drilled Holes

1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 07 84 00 - FIRESTOPPING.

2. Pack sleeves in exterior walls below grade and concrete floor slabs at or below with mechanical modular seals.

3.6 ESCUTCHEONS

A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:

1. In Finished Spaces: chrome plated cast brass.

2. Unfinished Spaces (Including Exterior Concrete Slabs): unplated cast iron.

3. Fasten plates with set screws.

4. Plates are not required in pipe shafts or furred spaces.

3.7 PIPE AND FITTING SCHEDULE

A. Refer to Drawings for Piping Application Schedule.

B. Where options are given, choose only one (1) option for each piping service. No deviations from the selected option will be allowed.

END OF SECTION

SECTION 22 3300
DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Domestic Water Heaters indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Water heater shall be UL listed and labeled.

B. Water heater shall bear the seal of the American Gas Association.

C. Comply with the Iowa State Energy Code.

D. Water heater performance shall meet the adopted version of ASHRAE 90.1.

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions for each water heater, gas vent pipe, fittings, and accessories required for the vent system.

1.4 WARRANTY

A. Manufacturer's Warranty: Three (3) year warranty for the glass lined water heater tank. Provide a copy of the warranty as part of the closeout documents.

PART 2 - PRODUCTS

2.1 TANK TYPE WATER HEATERS

A. Acceptable Manufacturers

1. A.O. Smith
2. Bradford White
3. Bock Water Heaters
4. Laars
5. PVI
6. RBI
7. Rheem / Ruud

8. State

B. Tank: Welded steel, factory tested at 300 psi and rated for 160 psi working pressure.

1. Glass lining permanently bonded to tank interior surface.

2. Tank nipples factory installed.

3. Maintenance-free powered, renewable magnesium anode.

4. Corrosion resistant dip tube.

5. Drain and relief valve tapping.

6. Renewable bronze boiler drain.

C. Capacity of water heaters shall be as scheduled on the drawings.

D. Water heaters shall be supplied with factory Pressure-Temperature Relief Valves sized for the specific application. Valves shall be AGA Z21.22 compliant; bronze body with stainless steel internals and threaded blow-off connection. Valves shall be field installed.

2.2 ELECTRIC WATER HEATERS

A. Heating Elements: Immersion type, replaceable; 75 watts per square inch maximum watt density.

B. Controls: Adjustable setpoint, interlocked with overheat control, including automatic shut-off.

C. Wiring: Factory interwired, requiring only a single field electric connection to put the heater into service.

D. Outer Casing: Steel with baked enamel or acrylic finish. Access door for servicing thermostats and heating elements.

2.3 INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Install the water heater on a level, firm base.

C. Install the pressure-temperature relief valve in the dedicated tank tapping. Pipe the relief valve blow-off to a point 6 inches above the floor, or as shown on drawings.

D. Install unions and shut-off valves on hot and cold water connections. Install dielectric unions if required.

E. Flush and fill tank. Do not switch on heating elements until tank is full and entrapped air is eliminated. Install the Work of this section in accordance with NFPA 54, NFPA 211, and the manufacturer's printed installation instructions, unless otherwise specified.

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES AND EQUIPMENT INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Plumbing Fixtures and Equipment indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Refer to the Plumbing Material Lists and Equipment Schedules for additional capacity and equipment requirements.

1.3 SUBMITTALS

A. Fixture and Equipment Data: Catalog sheets, specifications, rough-in dimensions, and installation instructions for each item specified except fasteners.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Comply with the most recent version following standards:
    a. Safe Drinking Water Act (SDWA) and the associated lead content requirements.
    b. Applicable sections of ANSI/ASME A112 – Standards for Plumbing Equipment

2. Materials and installations designated as handicapped accessible shall conform with the following:
    a. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
    b. The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), (Appendix A to 28 CFR Part 36).

3. Each fixture carrier support shall be listed by model number in the fixture support manufacturer's Fixture Support Selection Guide as being recommended for support of the appropriate fixture.

B. Plainly and permanently mark each fixture and fitting with the manufacturer's name or trade mark.

C. Acid resistant surfaces shall be plainly and permanently marked with the manufacturer's label or symbol indicating acid resistance.

1.5 MAINTENANCE

A. Special Tools: Deliver to the Owner.

1. Furnish the following tools labeled with names and locations where used.

   a. Keys for stops (furnished with stops).
   b. Tools for Vandal Resistant Fasteners: Two (2) for each type and size.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The following manufacturers are considered equal to the basis of design listed in the material list and schedules. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

Equipment	Acceptable Manufacturers
Backflow	Apollo, Febco. Watts, Zurn/Wilkins
Domestic Water Circulation Pumps	Armstrong, Bell & Gossett, Grundfos, Taco
Drainage Fixtures	Josam, Mifab, Smith, Sun, Wade, Watts, Zurn
Drinking Fountains	Acorn, Elkay, Halsey Taylor, Haws, Oasis
Expansion Tanks	Amtrol, Armstrong, Bell & Gossett, Elbi, Taco, Watts
Fixture Carriers	Jay R. Smith, Josam, Mifab, Zurn
Flush Valves	Delta Commercial, Moen Commercial, Sloan, Toto, Zurn
Hose Bibbs & Misc. Valves	Apollo, Smith, Watts, Willoughby, Woodford, Zurn
Lavatories, Urinals, Water Closets (Fixtures)	American Standard, Eljer, Kohler, Sloan, Toto, Zurn
Lavatory & Sink Trim	American Standard, Chicago Faucet, Delta Commercial, Kohler, Moen Commercial, T&S Brass, Sloan, Zurn
Mixing Valves	Armstrong, Bradley, Lawler, Leonard, Powers
Mop And Service Sinks	Fiat, Stern-Williams, Zurn
Water Hammer Arrestors	Sioux Chief, Watts, Jay R. Smith, Zurn

B. All items shall be commercial grade unless specified otherwise.

C. All items shall be supplied by the same manufacturer.

2.2 FIXTURE MATERIALS

A. Vitreous China: First quality, smooth, uniform color and texture, with fused on glaze covering surfaces exposed to view.

1. Surfaces shall be free of chips, craze, warpage, cracks and discolorations. Surfaces in contact with walls or floors shall be flat, with warpage not to exceed 1/16 inch per foot.

2. Color: White.

B. Porcelain Enameled Cast Iron: Smooth, uniform color and texture, having fused on glaze covering surfaces exposed to view.

1. Material shall show no cracks, chips, craze or discolorations.

2. Enameled surfaces shall be acid resistant unless otherwise specified.

3. Color: White.

C. Fixture Trim: Brass, bronze, or stainless steel construction; consisting of supply and waste fittings, faucets, traps, stop valves, escutcheons, sink strainers, nipples, supplies, and metal trim.

1. Brass piping: Ips standard weight, with standard weight, 125 lb cast brass fittings.

2. Brass tubing: 18 B & S gauge.

3. Stainless steel: 18-8 Type 302 or 304 unless otherwise specified.

D. Fixture Trim Finishes:

1. Brass or Bronze: Polished or satin finished chrome plating, 0.02 mil chromium over 0.2 mil nickel plating.

2. Stainless Steel: Invisible welds and seams, and unless otherwise specified, polished to No. 4 commercial finish.

E. Fixture Hold-down Bolts: Steel, plated for corrosion resistance.

1. Cap nuts: Metal, polished and chrome plated.

2. Vandal Resistant Fasteners: Torx head with center pin.

2.3 FIXTURE SUPPORTS AND SUPPORTING DEVICES FOR LAVATORIES, SINKS, AND EQUIPMENT

A. General: Ferrous metal members of carriers and supporting devices, with the exception of chrome plated or porcelain enameled cast iron, shall be factory painted for corrosion resistance.

B. Floor Mounted Carrier Supports: Steel pipe uprights, 1-1/4 inch ips minimum diameter, or 1 inch x 2 inch steel tubing uprights, with cast iron or welded steel feet, drilled for bolting to the floor construction. Each carrier shall be provided with the appropriate fixture supporting devices specified, or recommended by the carrier manufacturer's Fixture Support Selection Guide.Floor

mounted carrier supports for banks of multiple adjacent fixtures shall have provisions in the support uprights to allow for waste piping to be concealed in the associated wall.

2. Concealed Arms: Steel, with fixture locking lugs, leveling screws and a means of attaching, positioning and securing the fixture to the carrier.

    a. Trim: Polished, chrome plated metal escutcheon to space fixture two inches from the wall.

3. Exposed Arms: Cast iron or steel, porcelain enamel finished, with locking lugs, and leveling screws. Include studs, nuts and washers for fixture to be supported.

    a. Trim: Polished and chrome plated metal cap nuts and washers.
    b. Vandal Resistant Trim: Polished, chrome plated metal cap nuts and washers retained with vandal resistant set screws or other approved means of securing trim.

C. Wall Mounted Carrier Supports: Plate type system, with steel plates on both sides of the wall and through-bolted. On walls having an integral finish, a single plate wall carrier designed for such installations may be used. Each carrier shall be provided with the appropriate fixture supporting devices specified, or recommended by the Carrier manufacturer's Fixture Support Selection Guide.

1. Concealed Arms: Steel, with fixture locking lugs, leveling screws and a means of attaching, positioning and securing the fixture to the carrier.

    a. Trim: Polished, Chrome plated metal escutcheon to space fixture two inches from the wall.

2. Exposed Arms: Cast iron or steel, porcelain enamel finished, with locking lugs, and leveling screws. Include studs, nuts, and washers for fixture to be supported.

    a. Trim: Polished and chrome plated metal cap nuts and washers.
    b. Vandal Resistant Trim: Polished, chrome plated metal cap nuts and washers retained with vandal resistant set screws.

D. Bearing Plate: Steel, minimum 1/8 inch thick, and provided with bearing studs, nuts and appurtenances required by the fixture to be supported.

1. Fixture Hanger: Furnished by the fixture manufacturer.

E. Wood Stud Filler Piece: 2 inch x 8 inch wood planking cut to fit between wood studding. Fasten with four 3/8 inch x 2-1/2 inch lag bolts with washers.

F. Water Closet Carriers

1. Closet Carrier (For Wall Hung Water Closets): Commercial type cast iron combination chair carrier and drainage fitting with the following:

    a. Capacity: 500 pounds.
    b. Face Plate: Cast iron; height adjustable.
    c. Feet: Cast iron, adjustable, with provisions for bolting to the floor slab.
    d. Studs, Nuts and Washers: Steel, treated for corrosion resistance.
    e. Fixture Washers: Plastic.
    f. Adjustable Closet Connection: Cast iron, steel, or ABS plastic.
    g. Fitting Ends: Compatible with the drainage piping system.
    h. Gasket: Impregnated felt or neoprene closet gasket; lead or neoprene face plate gasket.

i. Stud thread protectors.
j. Factory painted.
k. Trim: Polished chrome plated metal cap nuts and washers.
l. Vandal Resistant Trim: Polished chrome plated metal cap nuts and washers retained with vandal resistant set screws.

G. Urinal Carriers

1. Floor Mounted Carrier Support (For Wall Hung Urinals): 1-1/4 inch ips steel pipe upright supports with block feet arranged with provisions for bolting to the floor slab, and with the following:

a. Hanger Plate: Steel, height adjustable with provisions for mounting and positioning the fixture hanger.
b. Bearing Plate: Steel, adjustable, with bearing studs, nuts and washers.
c. Studs, Nuts and Washers: Steel, treated for corrosion resistance.
d. Fixture Washers: Plastic.
e. Stud thread protectors.
f. Factory Painted.
g. Trim: Polished chrome plated metal cap nuts and washers.
h. Vandal Resistant Trim: Polished chrome plated metal cap nuts and washers retained with vandal resistant set screws.

2. Floor mounted carrier supports for banks of multiple adjacent fixtures shall have provisions in the support uprights to allow for waste piping to be concealed in the associated wall.Ferrous metal members of carriers and supporting devices with the exception of chrome plated or porcelain enameled cast iron shall be factory painted for corrosion resistance.

2.4 CIRCULATING WATER PUMPS

A. In-Line Pump: Pump to be UL listed & rated to a pressure of 125 PSI at 225 degrees Fahrenheit. Pump shall be a sealed wet rotor design, shaft and bearings shall be ceramic and lubricated by the system fluid. Motor shall be non-overloading with thermal overload protection. Pump volute shall be of stainless steel or bronze suitable for domestic hot water. Refer to the schedule and details on the drawings for additional installation, capacity and construction requirements.

B. Variable Speed In-Line Pump: Pump to be UL listed and rated to a pressure of 125 PSI at 225 degrees Fahrenheit. Pump shall be a sealed wet rotor design. Shaft and bearings shall be ceramic and lubricated by the system fluid. Motor shall be a variable speed permanent-magnet with thermal overload protection. Pump volute shall be of stainless steel or bronze suitable for domestic hot water. Refer to the schedule and details on the drawings for additional installation, capacity and construction requirements.

2.5 CLEANOUTS

A. Threaded pipe fitting or cast iron ferrule with gas tight cleanout plug.

B. Plug: Cast brass or bronze, with threaded end, and raised or countersunk head. Tapped head for attachment of cleanout wall or deck plate covers where required.

C. Covers: See Plumbing Material List.

D. Anti-Seize Lubricant: Never-Seez by Bostik Chemical Group, Molycote 1000 by Dow Corning Corp, Anti-Seize Lubricant by Loctite Corp

E. Membrane flange and clamping collar, secured with corrosion resistant fasteners.

2.6 AIR GAP FITTINGS

A. Provide when called for in Plumbing Material List.

B. Coated cast iron body with air gaps, set screw or threaded inlet, and outlet connection to match piping option selected.

2.7 DRAIN VALVES

A. Provide on all equipment with drain connections and as shown on details.

B. Cast brass body with renewable units, hose bibb vacuum breaker (ASSE 1011) with drainage feature, and removable cast iron handwheel with vandal resistant fastener.

1. Valve must be completely assembled to make hose connection.

2. Connections: 1/2 or 3/4 inch threaded or solder end inlet, and 3/4 inch hose bibb outlet.

2.8 WATER HAMMER ARRESTERS AND AIR CHAMBERS

A. Provide water hammer arresters as specified on the Plumbing Material List.

B. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged for operation between -100º F and 300º F and maximum 250 psig working pressure.

PART 3 - EXECUTION

3.1 FIXTURE SUPPORT AND SUPPORTING DEVICE INSTALLATION

A. Install heavy duty floor mounted carrier supports with specified fixture supporting devices for wall type plumbing fixtures.

1. Secure to building construction with lag bolts and metal expansion shields, or other appropriate means as required by the construction encountered.

B. Attach fixtures to floor or wall construction as specified in the Plumbing Material List.

C. Fixture Supporting Devices: Attach fixtures by means of the following fixture supporting devices attached to carrier supports.

FIXTURE	SUPPORTING DEVICE
Clinical Service Sink	Fixture hangers & bearing
Lavatory, VC, with back	Concealed arms
Lavatory, VC, no back	Concealed arms

FIXTURE	SUPPORTING DEVICE
Lavatory, ECI, with back	Exposed arms
Lavatory	Concealed arms
Lavatory	Through bolt
Shower Fixtures	American Standard, Aqua Bath, Aquatic
Shower Trim	Bradley, Chicago Faucet, Lawler, Leonard, Moen Commercial, Powers, Symmons, Toto, Zurn
Surgeon's Sink	Concealed arms & valve support plate
Water Closet	Bolt to comb. carrier and drainage fitting
Urinal	Fixture hanger and bearing plate
Water Cooler (wall mounted)	Fixture hanger
Water Cooler (Recessed)	Mounting frame

D. Secure exposed external components in place with vandal resistant fasteners or devices which cannot be removed without the use of special tools.

3.2 FIXTURE INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions.

B. See Architectural Floor Plans and Interior Elevation drawings for final installation locations and heights of all plumbing fixtures. Architectural plans supersede these specifications.

C. Install fixtures level and at proper height, tighten connections, and install hold-down bolts, cap nuts and cover plates, where required.

D. Caulk joint between all fixtures and wall or floor with sealant; strike a neat joint.

E. Secure exposed external components in place with vandal resistant fasteners or devices which cannot be removed without the use of special tools.

F. Mop Service Sinks

1. Set receptor leveled in bed of mortar laid on clean roughened surface. Remove excess mortar and strike a neat joint.

2. Make connection from drainage pipe to receptor drain.

3. Install service fittings and miscellaneous trim such as mop hanger and wall protection as called for on Plumbing Material List.

G. Lavatories

1. Mount lavatories 34 inches from finished floor to rim unless otherwise specified.

H. Countertop Fixtures

1. Install fixture with securing devices supplied.

2. Set fixture on bedding of clear sealant, tighten securing devices and remove excess sealant.

I. Water Closets

1. Wall Hung Fixtures:

   a. Standard Fixtures: Install wall hung fixtures 15 inches from finished floor to rim unless otherwise specified.
   b. Set bearing nuts to position fixture 1/16 inch clear of finished wall.

2. After connections are tightened, install cap nuts and washers.

J. Urinals

1. Wall Hung Fixtures

   a. Standard Fixtures: Install wall hung fixtures 24 inches from finished floor to rim.
   b. Set bearing nuts on floor mounted carrier supports to position wall hung fixtures 1/16 inch clear of finished wall.

2. After connections are tightened, install cap nuts and washers.

K. Flush Valves

1. Standard Fixtures: Install flush valves on fixture centerline, and at following heights above fixture rim or back to centerline of water inlet to flush valve.

   a. Water Closet: 11-1/2 inches.
   b. Urinal: 11-1/2 inches.

2. Handicapped Accessible Fixtures: Install flush valves on fixture centerline, and at following height above finished floor to centerline of flush valve operator. Distance between centerline of flush valve operator and centerline of water inlet is 1-1/2 inches.

   a. Water Closet: Approximately 31-1/2 inches, and mounted on wide side of stall.
      1) Coordinate mounting height with General Contractor to avoid interference with grab bar, and to facilitate flush valve servicing.
   b. Urinal: Maximum 44 inches.

3. Slip joints in flush pipe connections allowed only at fixture spud and vacuum breaker ends; others shall be screwed connections.

4. Score tubing ends before assembling to assure tight slip joint connections. No score marks shall be visible after assembly.

5. In utility corridors, solder screwed flush pipe connections.

L. Floor drains

1. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

2. Protect weep holes from plugging during installation. Rod out weep holes after installation to remove obstructions.

3. Set drainage flange flush with top of structural floor slab, or at elevation otherwise indicated.

4. After membrane waterproofing installed and cured, secure clamping ring.

5. Adjust strainer head to height indicated. If height not indicated, set at 1/2 inch below finished floor elevation.

M. Drains and Inlets During Construction

1. Provide a temporary cover for all floor, roof, trench and area drains during construction to prevent debris getting into the system and protect drain grates. Remove temporary covers and clean grates at the end of construction.

2. The contractor is responsible for the flushing of all drains used during construction. This includes main and branch lines. If solids or debris in the system result in flow issues, the contractor will be required to camera and remove obstructions.

N. Wall Hydrants: Installation Height: Minimum 18 inches above finished grade.

O. Cleanout Plug: Lubricate threads with anti-seize lubricant before final installation.

P. Water Hammer Arresters

1. Install water hammer arresters in accessible locations. Provide access doors as required. Coordinate type with Architect/Owner.

3.3 PUMP INSTALLATION

A. Install in-line circulating pumps between pipe flanges in piping systems. Install overhead pipe supports, both sides of in-line pumps, installed in horizontal piping runs.

3.4 CLEANING, FLUSHING AND ADJUSTMENT

A. Clean fixtures and trim. Remove grease and dirt; polish surfaces but leave stickers and warning labels intact.

B. Flush supply piping and traps; clean strainers.

C. Adjust stops for proper delivery.

END OF SECTION

SECTION 23 0500
HVAC COMMON WORK RESULTS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes basic mechanical requirements, which are applicable to all Division 21, 22 and 23 sections.

B. Overview of work

1. Demolition / Relocation / Modification

2. HVAC

3. Plumbing

C. In these documents, “Contractor” refers to the mechanical contractor and all their subcontractors, unless listed otherwise. The division of work within the mechanical scope is the responsibility of the lead mechanical contractor.

D. Contractor is responsible for providing fully functional systems.

E. If work is shown on the drawings or listed in the specifications, it shall be included by the Contractor.

F. If equipment is provided by the Contractor, it shall be installed by the Contractor, unless noted otherwise.

G. The drawings are necessarily diagrammatic by their nature and are not intended to show every connection in detail or every item in its exact location. Carefully investigate structural and finish conditions and coordinate the separate trades in order to avoid interference between the various phases of Work. Organize and lay out Work so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Install all Work parallel or perpendicular to building lines unless otherwise noted.

H. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

I. All sizes as given are minimum except as noted.

J. Materials shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the Architect’s, Engineer’s, and Owner’s observations from the commencement until the acceptance of the completed work.

1.2 REFERENCES

A. Applicable provisions of Division 0 and Division 1 govern work under this Section.

B. All work shall conform to the most current version of all applicable codes and standards or the version adopted by the jurisdiction.

C. Codes

1. International Building Code
2. International Mechanical Code
3. Uniform Plumbing Code
4. International Fuel Gas Code
5. International Fire Protection Code
6. International Energy Conservation Code
7. NFPA – National Fire Protection Association

D. Standards

1. ASHRAE Standard 15
2. ASHRAE Standard 62
3. ASHRAE Standard 90.1
4. SMACNA – Sheet Metal and Air Conditioning Contractors National Association, Inc.
5. AMCA – Air Movement and Control Association
6. ASME – American Society of Mechanical Engineers
7. ANSI – American National Standards Institute
8. ARI – Air Conditioning and Refrigeration Institute

E. Governing Bodies

1. Owner's Insurance Company
2. State Fire Marshal
3. AHJ – Authority Having Jurisdiction
4. UL - Underwriters Laboratories

1.3 SUBMITTALS

A. The review of shop drawings by the Engineer is for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with the requirements of the plans and specifications. Approval of a specific item shall not include approval of an assembly of which the item is a

component. The Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination with the Work of all trades; and for performing all work in a safe and satisfactory manner.

B. Refer to individual technical specification sections for specific submittal requirements.

C. Submission of shop drawings electronically In .PDF format is preferred.

D. If hard copies of shop drawings are utilized on this project, coordinate the quantity with the Architect and General Contractor. Provide one (1) copy for the Engineer's records.

E. The Engineer will review one resubmittal for each product. If additional resubmittals are required, the Contractor shall be responsible to bear the cost for the Engineer to recheck and handle the additional shop drawing submittals. Documents will not be reviewed until payment is agreed upon.

F. Contractor may request electronic AutoCAD files from the Engineer if needed to complete their shop drawings. An Electronic File Request Form will be sent to the contractor if files are requested and must be completed and signed before the AutoCAD files are released to the Contractor.

G. All submittals for equipment and materials shall be reviewed and approved by the engineer prior to the fabrication or release by the contractor. This includes fabrication drawings for ductwork and fire protection and the coordination of equipment between trades. The release, purchase, installation or fabrication of any items prior to the contractor receiving an approved shop drawing will be at the contractor's own risk. Any rework that results will be provided by the contractor at no cost to the Owner or design team.

H. Submittals must be reviewed and approved by the Contractor before submitting to the Engineer.

I. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified.

1.4 QUALITY ASSURANCE

A. Warranty

1. Equipment warranty shall be a minimum of one (1) year from date of factory supervised startup or from the date of substantial completion, whichever is later.

2. Contractor shall warranty all of their work for one (1) year from the date of substantial completion.

B. Equipment Capacity

1. All equipment submitted shall meet or exceed the capacity listed in the specifications and schedules. This includes airflows / static pressure, heating / cooling capacities, pump flow / head, and all values listed in the construction documents.

2. All submitted motor brake horsepower's submitted shall be at least 5% less than the rated nominal motor horsepower. No motors shall be selected in the motor service factor with the exception of fire pumps.

3. The mechanical contractor shall be responsible for any structural, electrical, piping, ductwork or other utility modifications resulting from an alternate manufacturer than the basis of design being used.

C. These documents are diagrammatical in nature and intended to convey scope and general arrangement of the mechanical systems. Not all fittings, risers, size changes, offsets, valves, accessories, etc. are shown on plan. If items are required to make a system fully operational but not shown on plan or in these specifications, they shall be included by the contractor.

D. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

E. It is the contractor's responsibility to determine all utility routing prior to purchase and installation of material.

F. For remodel or addition projects, the contractor shall visit and survey the site prior to submitting a bid. The contractor shall visit the site to understand the complexity of utility routing, phasing, staging, and all general installation. Submitting a bid means the contractor acknowledges the complexities of the project and has made provisions for overcoming these complexities in their bid.

G. The contractor shall report any discrepancies between these documents and site conditions immediately to the Engineer prior to submitting a bid or starting work. Submittal of a bid indicates that the contractor and the contractor's subcontractors have carefully and thoroughly reviewed the drawings, specifications, and other construction documents and have found them complete and free from ambiguities and sufficient for the purposes intended.

H. Install all equipment per the manufacturer's requirements / recommendations.

I. No equipment provided or installed shall contain mercury.

J. All equipment shall be UL listed where applicable.

1.5 ELECTRONIC DOCUMENT RELEASE

A. Electronic versions of the bid documents will be made available to the contractors for use during the bidding process and to help generate fabrication drawings for various systems. A summary of the requirements for the various document types is listed below:

1. PDF

   a. Contact the Construction Manager or Architect to obtain a PDF version of the Bid Documents. No Document Release Form is required.

2. AutoCAD

   a. Bluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.

b. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCAD and drawings required. No fee is associated with these drawings.

3. REVIT

a. The REVIT drawings will be converted to AutoCAD and then transferred to the contractor.
b. Bluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.
c. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCad and drawings required.
d. Submittal of the document release form will be required prior to the AutoCAD files being transmitted.

1.6 SUBSTITUTIONS

A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:

1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.

2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.

3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.

C. Approval

1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.

2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repaired at the sole expense of the contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

1.7 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Engineer and the Owner. Any outage must be scheduled when the interruption causes the least interference with normal work schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours unless specifically noted in the Specifications or in the bidding requirements.

B. This Contractor shall restore any mechanical services interrupted as a result of a lack of coordination to proper operation as soon as possible.

C. Contractor shall notify Owner of any utility service shutdown forty-eight (48) hours in advance. This includes gas, water, sanitary, storm, fire protection, cooling, and heating systems.

1.8 REGULATORY AND UTILITY REQUIREMENTS

A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.

B. Contractor is responsible for paying for all fees, permits, and inspections that are required to complete their work.

C. Contractor shall include all work required to relocate utilities and meters as shown on drawings.

D. Contractor shall include all work required to install new utilities and meters as shown on drawings. This includes any new service and meter fees in coordination with the utility company.

E. Utility work 5’-0” from outside of building is by others.

1.9 PROTECTION OF FINISHED SURFACES

A. Furnish one (1) can of touch-up paint for each different color factory finish for equipment furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.10 SEALING AND FIRESTOPPING

A. Sealing and firestopping of sleeves/openings between ducts and piping and the structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening General Contractor. The contractor responsible shall hire individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

1.11 WORK BY OWNER AND/OR OWNER AGENCY

A. Asbestos abatement, removal and disposal, if required, will be by the Owner under separate contract.

1.12 OMISSIONS

A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect and Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.13 DELIVERY, STORAGE, AND HANDLING

A. All equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.

B. Store equipment indoors in clean dry space with uniform temperature to prevent condensation or damage from the elements.

C. Take such precautions as are necessary to protect apparatus and materials from damage. Damaged equipment shall be, as determined by the Owner and/or Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.

D. Protect factory finish from damage during construction operations until acceptance of the Project. Restore any finishes that become stained or damaged to Owner's satisfaction.

1.14 WORK SEQUENCE AND SCHEDULING

A. Install work in phases to accommodate the Owner's occupancy requirements. During the construction period coordinate mechanical schedule and operations with the General Contractor.

1.15 DIVISION OF WORK AND COORDINATION

A. The Electrical Contractor is responsible for providing and installing power wiring up to equipment provided by others for a single point connection. Internal wiring of equipment provided by others shall be the responsibility of the contractor responsible for providing and installing the equipment.

B. Controls, disconnect switches, starters, variable frequency drives, etc. shall be provided and installed by the contractor noted on the plans and in the specifications. It is the responsibility of the Contractor to request written clarification for any ambiguity regarding division of work and coordination at least ten (10) days prior to bid.

C. See Section 230900 for scope of wiring required for Temperature Control systems.

D. Utilities routed within the building shall be installed in an orderly manner. All work will be coordinated with other disciplines prior to installation. The following list ranks the priority of the utilities to be installed:

1. Light fixtures
2. Gravity piping
3. Electrical busduct
4. Ductwork
5. Cable tray
6. All other piping

7. Electrical conduits

E. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

F. Coordinate work with the Testing and Balancing (TAB) Contractor. Verify system completion to the TAB Contractor such as pressure testing, chemical treatment, filling of liquid systems, proper pressurization and air venting of hydronic systems, clean filters, clean strainers, controls adjusted and calibrated, fire/smoke damper integration ready for testing, adjusting and balancing work. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, temperature controls, etc., required for functional and balanced systems. Assist the TAB Contractor as needed to complete their work.

G. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

H. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

I. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

1.16 SALVAGE MATERIALS

A. No materials removed from this project shall be reused except as specifically noted or allowed on the Drawings. All materials removed shall become the property of, and shall be disposed of by, the Contractor except for items the Owner has designated they will keep.

1.17 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation as applicable:

1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.

2. A control sequence describing start-up, operation, and shutdown.

3. Description of the function of each principal item of equipment.

4. Installation instructions.

5. Safety precautions for operation and maintenance.

6. Diagrams and illustrations.

7. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers and replacement frequencies.

8. Performance data.

9. Where applicable, pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.

10. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

1.18 RECORD DRAWINGS

A. The Contractor shall maintain at least one copy each of the Specifications and Drawings on the job site at all times.

B. The Architect will provide the Contractor with a suitable set of Contract Drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.

C. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.

D. At completion of the project, the Contractor shall submit the marked-up record drawings to the General Contractor prior to final payment.

1.19 SPECIAL REQUIREMENTS

A. Contractor bid shall allow color selection by Architect of any piece of exposed equipment from all available colors. Base bid color selection shall include those considered ‘premium’ by the manufacturer.

PART 2 - PRODUCTS

2.1 SEALING AND FIRESTOPPING

A. Non-Rated Penetrations

1. Piping and Ductwork Penetrations

a. At penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe/duct and sleeve or opening.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Coordinate work with the Owner to minimize disruption to the existing building occupants.

C. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed. Perform demolition that may not be shown but required to accomplish new work. Where ductwork or piping is removed and not reconnected with new work, cap ends of existing services as if they were new work.

D. Remove portion of ductwork or piping indicated to be removed and cap or plug remaining utility with same or compatible materials.

E. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the Owner. All designated equipment is to be turned over to the Owner for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

F. Unless noted otherwise, all duct and piping branches shown to be removed shall be removed back to the main and capped. Pressure piping shall have shutoff valves and caps installed.

G. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations

D. Install equipment to allow right of way for piping installed at required slope.

E. Provide clearance for inspection, repair, replacement, and service to all equipment to include a minimum of 36 inches from all obstructions (walls, structure, ductwork, pipes, etc.). Clearance shall maintain access to all electrical panels, access doors, controllers, valves, junction boxes and operators and include the area directly in front of and above the system components.

3.3 EXCAVATION AND BACKFILL

A. Perform all excavation and backfill work to accomplish indicated mechanical systems installation in accordance with Section 312316.13 - Trenching.

3.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases not less than 4 inches larger in both directions than supported unit.

2. All pads to be a minimum of 4” thick unless noted otherwise. Thicken pads as needed to accommodate the slope of slab / grade around the equipment.Exterior pads installed on grade to include frost footings. Coordinate requirements with the civil / structural designers. Refer to equipment schedules for additional requirements.

5. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

6. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

7. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

8. Install anchor bolts to elevations required for proper attachment to supported equipment.

9. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

10. Indoor or outdoor equipment meeting any or all of the following requirements shall be installed on housekeeping pads:

    a. Floor mounted motorized equipment.
    b. All floor or ground mounted air handling equipment and fans.
    c. All heating, cooling, plumbing, and fire protection equipment and associated floor mounted accessories located in mechanical spaces.
    d. Equipment installed in areas with uneven surfaces and surfaces that are not level.
    e. As required by the equipment manufacturer

11. Refer to plans and details for additional pad locations.

3.5 SEALING AND FIRESTOPPING

A. Non-Rated Surfaces

1. When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approved type of material.

2. Install escutcheons or floor/ceiling plates where pipe/duct penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.

3. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe/duct and tighten in place, in accordance with the manufacturer's instructions. Install so that the bolts used to tighten the seal are accessible from the interior of the building or vault.

4. At interior partitions, pipe/duct penetrations are required to be sealed for all clean rooms, laboratories, and most hospital spaces, computer rooms, dormitory rooms, telephone/data/com rooms and similar spaces where the room pressure or odor transmission must be controlled. Apply sealant to both sides of the penetration in such a manner that the annular space between the sleeve and the pipe/duct is completely filled.

3.6 HOUSEKEEPING AND CLEAN UP

A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.7 SITE OBSERVATIONS

A. Site observations shall be performed by the Engineer at the following project milestones:

1. Prior to enclosure of the following areas:

    a. Underfloor
    b. Walls and chases
    c. Above the ceiling

2. Final project completion

B. Contractor shall provide seven (7) working days' notice to Engineer prior to site visit.

C. The Engineer is only responsible to conduct one (1) final site visit for each phase of the project. If upon visiting the site, the Engineer finds that not enough work is complete for the final site visit, the Contractor shall be responsible to bear the cost for the Engineer to travel to the site and revisit. Revisiting will not occur until payment is agreed upon.

3.8 EQUIPMENT STARTUP

A. Contractor shall provide startup of equipment by factory certified personnel for equipment listed above.

B. For all other equipment, Contractor shall perform startup per manufacturer's requirements. Startup shall be performed by personnel qualified for this work.

C. Contractor shall test equipment to be fully functional. Test all equipment safeties and emergency stops. Test all control set-points and equipment modes.

D. Contractor shall return to site as needed to adjust equipment for seasonal equipment performance changes.

3.9 OWNER TRAINING

A. Contractor shall include at least eight (8) hours in their bid to provide complete Owner training for all the mechanical systems. Training shall include explanation of system operation, startup/shutdown, routine maintenance, seasonal changes, and controls adjustments. Coordinate acceptable training schedule with Owner.

B. All training provided for the Owner shall comply with the format, general content requirements and submission guidelines specified under Section 019101, or 019102.

3.10 PROJECT CLOSEOUT REQUIREMENTS

A. Final project closeout tasks

1. Deliver all spare parts listed in each specification section. Deliver to Owner chosen location.

2. All equipment labeled per specifications.

3. All equipment cleaned and ready for use. Install new filters in all equipment with filters; do not use Owner's spare filter sets.

B. Contractor requirements

1. Marked up drawings and specifications provided to Engineer for incorporation of as-built drawings or to serve as the as-built drawings depending on the project requirements. As-built drawings shall be clean and legible.

2. Operation and Maintenance (O & M) Manuals shall include the following:

   a. Contractor contact for warranty work
   b. Approved shop drawings, incorporating all review comments
   c. Warranty copies
   d. Equipment start-up reports
   e. Testing and balancing reports
   f. Operation and maintenance instructions

3. Utility Rebate Forms

   a. Contractor shall submit completed energy rebate forms for each piece of equipment that is eligible for a rebate. Eligible equipment shall include, but not be limited to the following:
      1) Split System Air Conditioners

   b. Contractor to complete information regarding equipment. Submit form to Owner, Owner will complete Owner's contact information and send the completed form to the utility.

4. Three (3) final approved O & M Manuals shall be delivered to Owner. Each manual shall be an appropriately sized three (3) ring binder with a vinyl cover and printed spine and cover labels. Each section shall have a printed divider tab. Each section shall be listed in a table of contents at the beginning of the manual.

END OF SECTION

(ELECTRONIC DOCUMENT RELEASE FORM & SUBSTITUTION REQUEST FORMS ATTACHED)

Document Release Form

Information Requested:

Project Name:
Drawings Requested:

Media Type: (Check all that are applicable)

- ☐ AutoCAD DWG Files (Version _____)
- ☐ REVIT Files (Version _____)
- ☐ Adobe PDF Files
- ☐ Other

Requesting Party:

Name:

Company:

Signature:

Date:

Address 1:

Address 2:

Email Address:

Phone #:

Bluestone Use:

Form Sent By:

Date:

Bluestone Project #:

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or sub consultants that may arise out of or in connection with your use of the electronic files. Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files. These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project. Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display.

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SUBSTITUTION REQUEST FORM (DURING BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution: _____

MANUFACTURER	TRADE NAME	MODEL NO.
_____	_____	_____

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

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

The Undersigned certifies:

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

Submitted by:

_____
Signature

_____
Firm

_____ Telephone
Email Date

Engineer's Review and Action

☐ Substitution Approved
☐ Substitution Approved As Noted
☐ Substitution Rejected
☐ Substitution Request Received Too Late

Signed by:

_____

Date

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

SECTION 23 0529
PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Pipe Hangers and Supports indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Refer to Section 230719, PIPING INSULATION for work related to this section.

1.3 SUBMITTALS

A. Product Data

1. Manufacturer's catalog sheets and specifications for hangers and supports materials.

2. Installation instructions.

3. Schedule indicating what type of hangers or support will be used for various piping types.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with the applicable requirements of the ASME B31 Piping Codes.

2. Unless otherwise shown or specified, comply with the requirements of the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69.

3. Materials for use in Sprinkler Systems and Standpipe and Hose Systems shall comply with the requirements of NFPA 13 and NFPA 14 as applicable.

4. Hang and support cast iron soil pipe and fittings in accordance with the recommendations of the Cast Iron Soil Pipe's Institute's (CISPI) Cast Iron Soil Pipe and Fittings Handbook.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddle with companion high density filler piece.

1. Insulating saddles and filler pieces shall be of the same thickness and materials as the adjoining pipe insulation. Saddles shall cover the lower 180 degrees of the pipe or

tubing, and companion filler pieces shall cover the upper 180 degrees of the pipe or tubing. Physical sizes, gages, etc. of the components of insulated hangers shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAUGE	SADDLE LENGTH (Inches)	VAPOR BARRIER JACKET LENGTH (Inches)
Up to 2-1/2	4	16	6	10
3 to 6	4	14	6	10
8 to 14	10	12	12	16
16 and up	10	10	12	16

B. Pipe Insulation Shields: Fabricated of steel, with a minimum arc of 180 degrees, unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAUGE
Up to 2-1/2	8	18
3 to 8	10	16
10 to 14	12	12
16 and up	18	10

C. Pipe Hangers: Height adjustable standard duty clevis type, with cross bolt and nut.

1. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers, when supporting piping ten (10) inches in size and larger.

2. Swivel ring type hangers will be allowed for sprinkler piping up to a maximum of two (2) inches in size.

D. Adjustable Floor Rests and Base Flanges: Steel.

E. Hanger Rods: Mild, low carbon steel, fully threaded or threaded at each end, with two (2) nuts at each end for positioning rod and hanger, and locking each in place.

F. Riser Clamps: Malleable iron or steel.

G. Rollers: Cast Iron.

2.2 ANCHORS AND ATTACHMENTS

A. Sleeve Anchors (Group II, Type 3, Class 3): Molly's Div./USM Corp. Parasleeve Series, Ramset's Dynabolt Series, or Red Head/Phillips AN, HN, or FS Series.

B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti's Kwik Bolt Series, Molly's Div./USM Corp. Parabolt PB Series, Ramset's Trubolt T Series, or Red Head/Phillips WS Series.

C. Self-Drilling Anchors (Group III, Type 1): Ramset's RD Series, or Red Head/Phillips S Series.

D. Non-Drilling Anchors (Group VIII, Type 1): Ramset's Dynaset DS Series, Hilti's HDI Series, or Red Head/Phillips J Series.

E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS Series.

F. Beam Clamps: Forged steel beam clamp, with weldless eye nut (right hand thread), steel tie rod, nuts, and washers, Grinnell's Fig No. 292 (size for load, beam flange width, and rod size required).

G. Metal Deck Ceiling Bolts: B-Line Systems' Fig. B3019.

H. Continuous Slotted Type Concrete Insert, Galvanized.

I. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded to receive 3/4 inch diameter machine bolts.

J. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, designed to accept 3/4 inch diameter bolts having special wedge shaped heads.

2.3 FASTENERS

A. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.4 SHOP PAINTING AND PLATING

A. Hangers, supports, rods, inserts and accessories used for pipe supports, unless chromium plated, cadmium plated or galvanized shall be shop coated with metal primer paint. Electroplated copper hanger rods, hangers and accessories shall be used when hangers are in direct contact with copper pipe or copper tubing.

B. Hanger supports for chromium plated pipe shall be chromium plated brass.

2.5 ROOFTOP SUPPORT SYSTEMS

A. Rooftop supports for piping equipment shall be provided for installation without requiring roof penetrations, flashing, or damage to the roofing material. Height-adjustable supports may be used where necessary. Support piping a minimum of 4" above the roof surface.

B. Materials:

1. Support bases shall be made of an engineered material with appropriate additives for UV protection. All structural steel components shall be hot-dipped galvanized.

2. The support shall have a continuous bottom surface to provide even load distribution and minimize point loading of the roof membrane. The support base will have a radiused edge to enhance compatibility with roof membranes.

3. Coordinate static load rating of the support(s) with the specific application being served.

4. Accessories: Clamps, bolts, nuts, washers, and other devices as required for a complete system.

C. Applications:

1. Fixed Strut Pipe Hanger Supports: Size and load ratings for the application

2. Adjustable Strut Pipe Hanger Supports: Height adjustable, size and load ratings for the application

3. Adjustable Single Piping Supports: Height adjustable, size and load ratings for the application

4. Block Supports: Size and load ratings for the application

5. Roller Supports: Height adjustable, size and load ratings for the application

6. Bridge Assemblies:

   a. Suitable for multiple piping runs or equipment
   b. Size and load ratings for the application

7. Post Base Assemblies:

   a. For use with vertical sections of channel support systems
   b. Size, channel support configuration, and load ratings for the application

D. Acceptable Manufacturers:

1. Caddy/Pentair

2. Cooper B-Line

3. Mifab, Arlington

4. Rooftop Blox

5. Haydon

6. MAPA Products

7. Miro Industries

PART 3 - EXECUTION

3.1 PREPARATORY WORK

A. Place inserts into construction form work expeditiously, so as not to delay the work of other trades.

3.2 INSTALLATION

A. Do not hang or support one (1) pipe from another or from ductwork.

B. Do not bend threaded rod.

C. Do not hang or support equipment from the bottom chord of joists.

D. Support all insulated horizontal piping conveying fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.

E. Space hangers or supports for horizontal piping on maximum center distances as listed in the documents, and as follows.

1. Cast Iron Soil Pipe:

a. General:
1) Where piping is suspended on centers in excess of 18 inches by means of non-rigid hangers, provide sway bracing to prevent horizontal pipe movement.
2) Additionally, brace piping five (5) inches and larger to prevent horizontal movement and/or joint separation. Provide braces, blocks, rodding or other suitable method at each branch opening, or change of direction

b. For Bell & Spigot Cast Iron Soil Pipe: Space hangers or support pipe at each joint or on maximum centers of five (5) feet. Place hangers or supports as close as possible to joints and when hangers or supports do not come within one (1) foot of a branch line fitting, install an additional hanger or support at the fitting.

c. For Hubless Cast Iron Soil Pipe: Space hangers or support pipe at each joint or on maximum centers of five (5) feet. Place hanger or supports as close as possible to joints and when hangers or supports do not come within one (1) foot of a branch line fitting, install an additional hanger or support at the fitting.

2. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.

3. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

4. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.

5. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be used. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

F. Size hanger rods in accordance with the following:

PIPE SIZE (Inches)	SINGLE ROD HANGER SIZE (Inches)		DOUBLE ROD HANGER SIZE (Inches)	
	PIPE	TUBING	PIPE	TUBING
1/2 to 2	3/8	1/4	3/8	1/4
2-1/2 and 3	1/2	3/8	3/8	1/4
4 and 5	5/8	1/2	1/2	3/8
6	3/4	1/2	5/8	1/2
8, 10 and 12	7/8	5/8	3/4	5/8

1. Secure hanger rods as follows: Install one (1) nut under clevis, angle or steel member; one (1) nut on top of clevis, angle or steel member; one (1) nut inside insert or on top of upper hanger attachment and one (1) nut and washer against insert or on lower side of

upper hanger attachment. A total of four (4) nuts are required for each rod, two (2) at upper hanger attachment and two (2) at hanger.

2. Size hanger rods, for piping over 12 inches in size and multiple line supports, based on a safety factor of five for the ultimate strength of the materials being used.

G. Vertical Piping

1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.

2. Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.

3. Support cast iron risers, by means of heavy duty hangers installed close to the base of the pipe risers, and 1/4 inch thick malleable iron or steel riser clamps with extension arms at each floor level, with the distance between clamps not to exceed 25 feet. Support cast iron risers in vertical shafts equivalent to the aforementioned.

4. Support hubless cast iron risers, by means of heavy duty hangers installed close to the base of the pipe risers, and by malleable iron or steel riser clamps with the extension arms at each floor level, with the distance between clamps or intermediate supports not to exceed 12 feet. Support risers in vertical shafts equivalent to the aforementioned.

H. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

I. Underground Cast Iron Pipe Supports: Firmly bed pipe laid underground, on solid ground along bottom of pipe. Install masonry piers for pipe laid in disturbed or excavated soil or where suitable bearing cannot be obtained. Support pipe, laid proximate to building walls in disturbed or excavated soil, or where suitable bearing cannot be obtained, by means of wall brackets or hold-fasts secured to walls in an approved manner.

3.3 UPPER HANGER ATTACHMENTS

A. General

1. Secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.

2. Do not attach hangers to steel decks that are not to receive concrete fill.

3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.

4. Do not use flat bars or bent rods as upper hanger attachments.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.

1. Do not use drive-on beam clamps.

2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.

3. Do not drill holes in main structural steel members.

4. Beam clamps, with tie rods as specified, may be used as upper hanger attachments for the support of piping, subject to clamp manufacturer's recommended limits.

C. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.

D. Attachment to Existing Cast-In-Place Concrete

1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine bolts.

2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.

3.4 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS AND SWAY BRACES

A. Install pipe anchors, restraints and sway braces, at locations noted on the Drawings. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner that will not affect the structural integrity of the building.

B. Cast Iron Soil Piping Systems

1. Where piping is suspended on centers in excess of 18 inches by means of non-rigid hangers, provide sway braces, of design, number and location in accordance with the Cast Iron Soil Pipe Institute's Cast Iron Soil Pipe and Fittings Handbook to prevent horizontal pipe movement.

2. Additionally, brace piping five (5) inches and larger to prevent horizontal movement and/or joint separation. Provide braces, blocks, rodding or other suitable method at each branch opening, or change of direction in accordance with the Cast Iron Soil Pipe Institute's Cast Iron Soil Pipe and Fittings Handbook to prevent horizontal pipe movement.

3.5 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180 degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.6 PIPE INSULATION SHIELDS

A. Unless otherwise specified, install a pipe insulation shield, at all points of support. Center shields on all hangers and supports outside of high density insulation insert, and install in such a manner so as not to cut, or puncture jacket.

3.7 ROOFTOP SUPPORT SYSTEM

A. Install in accordance with manufacturer's instructions and recommendations.

B. Provide complete and adequate support of all piping and equipment.

C. The use of wood blocks for supporting piping or equipment is not permitted.

D. Consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (isolation pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.

E. Use properly sized clamps to secure piping or equipment.

END OF SECTION

SECTION 23 0553
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Equipment Identification indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Items to be labeled

1. Plumbing and Piping Valves

2. Piping

3. Equipment (Including but not limited to the following)
   a. Fans
   b. Pumps

4. Thermostats

1.2 REFERENCES

A. ANSI A13.1 - Scheme for Identification of Piping Systems.

1.3 SUBMITTALS

A. Product Data

1. Manufacturer’s catalog sheets and specifications for mechanical identification materials.

2. Installation instructions.

3. Schedule indicating what type of materials will be used for various equipment, valves, piping, and devices.

PART 2 - PRODUCTS

2.1 EQUIPMENT TAGS

A. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.

B. Plastic Tags: 1/16” thick, UV resistant phenolic plastic. Minimum 1-1/2" square or round laminated with engraved, 1/4" minimum black letters on light contrasting background.

C. Tags shall be black with white lettering.

D. Lettering: Lettering shall be supplier’s normal font, minimum 1” high

2.2 VALVE TAGS

A. Brass Tags: 1-1/2” Round 19 gauge brass tags with 1/4” minimum engraved letters.

B. Plastic Tags: 1/16” thick, UV resistant phenolic plastic. 1-1/2” round laminated with engraved, 1/4" minimum black letters on light contrasting background.

C. Tags shall be brass or white with solid black lettering.

D. Provide with brass ball chain or plastic zip connectors to attach tag to valve

2.3 PIPE MARKERS AND ACCESSORIES

A. Snap-on Marker: One (1) piece wrap around type constructed of pre-coiled acrylic plastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, 3/4 inch adhesive strip on inside edge, and 360 degree visibility.

B. Strap-On Marker: Strip type constructed of pre-coiled acrylic plastic with clear polyester coating, integral flow arrows, legend printed in alternating directions, factory applied grommets, and pair of stainless steel spring fasteners.

C. Stick-On Marker: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, and integral flow arrows for applications where flow arrow banding tape is not being used.

D. Underground Marker: 6” wide, thickness depends on type. Detectable or non-detectable is acceptable. Provide detectable type for non-metallic piping such as plastic gas, water main, or underground PVC piping.

E. Pipe Marker Legend and Color Field Sizes:

OUTSIDE DIAMETER OF PIPE OR INSULATION (Inches)	LETTER SIZE (Inches)	LENGTH OF COLOR FIELD (Inches)
3/4 to 1-1/4	1/2	8
1-1/2 to 2	3/4	8
2-1/2 to 6	1-1/4	12
8 to 10	2-1/2	24
Over 10	3-1/2	32

F. Banding Tapes: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating.

1. Plain Tape: Unprinted type; color to match pipe marker background.

2. Flow Arrow Tape: Printed type with integral flow arrows; color to match pipe marker background.

G. Pipe Size Labels: Pressure sensitive adhesive backed type constructed of vinyl with clear polyester coating, vertical reading pipe size in inches, and legend size matching adjacent pipe marker.

PART 3 - EXECUTION

3.1 PREPARATION

A. Complete testing, insulation and finish painting work prior to completing the Work of this Section.

B. Clean pipe surfaces with cleaning solvents prior to installing piping identification.

C. Remove dust from insulation surfaces with clean cloths prior to installing piping identification.

3.2 PIPING IDENTIFICATION

A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Stick-On Pipe Markers:

1. Install minimum of two (2) markers at each specified location, 90 degrees apart on visible side of pipe.

2. Encircle ends of pipe markers around pipe or insulation with banding tape with one inch lap. Use plain banding tape on markers with integral flow arrows, and flow arrow banding tape on markers without integral flow arrows.

C. Pipe Size Labels: Install labels adjacent to each pipe marker and upstream from flow arrow. Install a minimum of two (2) pipe size labels at each specified location, 90 degrees apart on visible side of pipe.

D. Underground Pipe Markers: Install 8-12" above buried piping. Install along entire length of pipe.

3.3 PIPING IDENTIFICATION SCHEDULE

A. Piping Identification Types

Piping:	Field Color:	Lettering Color:
Domestic Water	Green	White
Sanitary, Vent, Condensate, Drain	Green	White
Acid Waste, Vent	Yellow	Black
Storm	Green	White
Chilled Water	Green	White
Heating Water	Yellow	Black
Snowmelt	Orange	Black
Refrigerant Piping	Yellow	Black
Steam, Condensate	Yellow	Black
Natural Gas	Yellow	Black
Propane	Yellow	Black
Sprinkler-Fire	Red	White
Compressed Air	Blue	White
Instrument Air	Red	White

Piping:	Field Color:	Lettering Color:
Carbon Dioxide	Gray	Black
Medical Air	Yellow	Black
Medical Vacuum	White	Black
Nitrogen	Black	White
Nitrous Oxide	Blue	White
Oxygen	Green	White
WAGD	Violet	White

B. Locate piping identification as follows:

1. Locate piping identification at valve locations; at points where piping enters and leaves a partition, wall, floor or ceiling, and at intervals of 20 feet on straight runs.

2. Where two (2) or more pipes run in parallel, place printed legend and other markers in same relative location.

3.4 EQUIPMENT IDENTIFICATION

A. Install engraved tags on equipment using metal rivets or stainless steel sheet metal screws with a pan head. For indoor equipment, industrial strength double-sided tape is acceptable if rivets or screws cannot be used. Install label on most visible side of equipment. Place identification along center line of equipment, if possible.

B. Label all mechanical equipment using the same callout as used on the drawings, by means of engraved tags.

C. Label all fire, fire/smoke, and smoke dampers with adhesive labels or permanent nameplates. Labels shall read “Fire Damper”, “Fire/Smoke Damper”, or “Smoke Damper” to match damper type.

D. Do not label equipment in exposed public spaces, e.g. cabinet unit heaters, diffusers, louvers, etc.

E. Label hidden equipment such as sump pumps on the control panel or disconnect if it does not make sense to label the equipment itself.

F. Label thermostats with the corresponding terminal air box or equipment served.

3.5 VALVE TAGS

A. Valve tags shall be engraved with the following information:

1. Service Abbreviation

2. Valve number

B. Service Abbreviation shall match piping nomenclature used on Drawings.

C. Attach tags to valves, not valve handles or wheels.

D. Trim excess from connecting strip or chain.

E. Valve Schedule

1. Provide a valve schedule that lists all valves not installed for individual plumbing fixtures. Valve schedule shall list the following information in order: service, tag number, size, usage (shut-off, balancing, control, etc.), name and number or room location, normally open or closed, pressure rating, manufacturer, model number, and installation date.

2. Provide three (3) laminated hard copies and one (1) electronic copy in .pdf format. Hard copies shall be clearly legible and a minimum of 11” x 17”.

3. Mount one (1) of the hard copies in a solid metal frame in a location designated by the Owner.

3.6 SPECIAL CONDITIONS

A. Additional labels shall be installed at the request of the Engineer/Owner.

END OF SECTION

SECTION 23 0593
CLEANING AND TESTING

PART 1 - GENERAL

1.1 SCOPE

A. Cleaning of systems to remove construction debris and prepare for testing and operation.

B. Perform testing on systems and equipment to confirm they can withstand normal operating and design conditions as outlined in various equipment sections.

C. Equipment Included in This Section

1. Refrigerant piping

2. Domestic water piping

1.2 REFERENCES

A. Balancing of Systems: Section 230594.

1.3 SUBMITTALS

A. Quality Control Submittals

1. Submit Field Test Reports for all systems to be tested.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Perform factory testing of factory fabricated equipment in complete accordance with the agencies having jurisdiction.

2. Perform field testing of piping systems in complete accordance with the local utilities and other agencies having jurisdiction and as specified.

1.5 PROJECT CONDITIONS

A. Protection: During test Work, protect controls, gages and accessories which are not designed to withstand test pressures. Do not utilize permanently installed gauges for field testing of systems.

1.6 SEQUENCING AND SCHEDULING

A. Transmit written notification of proposed date and time of operational tests to the Architect / Engineer at least five (5) days in advance of such tests.

B. Perform cleaning and testing Work in the presence of the Owner’s Representative.

C. Pressure test piping systems inside buildings, at the roughing-in stage of installation, before piping is enclosed by construction Work, and at other times as directed. Perform test operations in sections as required and directed, to progress the Work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested, utilizing valves required to be installed in the permanent piping systems or temporary valves or caps as required to perform the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Test Equipment and Instruments: Type and kind as required for the particular system under test.

B. Test Media (air, gas, refrigerant, dry nitrogen, vacuum, water): As specified for the particular piping or system under test.

C. Cleaning Agent (chemical solution, steam, water): As specified for the particular piping, apparatus or system being cleaned.

D. Propylene Glycol: Permanent type anti-freeze solution as manufactured by Dow Chemical Co. or Union Carbide.

PART 3 - EXECUTION

3.1 PRELIMINARY WORK

A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering systems. Prevent if possible and remove stoppages or obstructions from piping and systems.

B. Thoroughly clean compressed air, control air, refrigerant pipe and similar systems prior to pressure or vacuum testing.

1. Refrigerant Piping

a. Only use factory sealed refrigerant piping.
b. Crimp and braze caps on ends of previously cleaned piping at the end of the day if piping was cut.
c. When brazing, purge lines with dry nitrogen.

3.2 PRESSURE TESTING OF PIPING

A. Piping shall be tight under test and shall not show loss in pressure or visible leaks, during test operations or after the minimum duration of time as specified. Remove piping which is not tight under test; remake joints and repeat test until no leaks occur.

B. Water Systems

1. Domestic water (potable cold, domestic hot and recirculation) inside buildings:

a. Before fixtures, faucets, trim and accessories are connected, perform hydrostatic

test at 125 psig minimum for four (4) hours.

b. After fixtures, faucets, trim and accessories are connected, perform hydrostatic retest at 75 psig for four (4) hours.

2. Circulating water systems, including propylene glycol solution systems and cold water make-up piping connections to heating, ventilating, air conditioning and refrigeration systems, unless otherwise specified:

a. Before final connections are made perform hydrostatic test at 1-1/2 times the maximum working pressure, but not less than 125 psig, for four (4) hours.

b. After final connections are made perform hydrostatic retest at a pressure equal to maximum operating system design pressure, but not less than 30 psig, for four (4) hours.

3.3 TESTING OF EQUIPMENT, APPARATUS AND APPURTENANCES

A. Relief Valves: Increase pressure in equipment or apparatus to relief valve setting, to test opening of valves at required relief pressures.

3.4 REFRIGERATION SYSTEMS – TESTING, DEHYDRATION AND CHARGING

A. Leak Test Procedure

1. Refrigerant Piping Systems

a. Pressurize with dry nitrogen to 50 psig and test for leaks using a bubble type solution.

b. Release this partial test pressure and correct deficiencies.

c. Charge system with a trace of refrigerant to 15 psig, then add dry nitrogen until system test pressures are reached and retest for leaks with an electronic leak detector.

d. Release pressure, repair leaks and retest as necessary until no leaks occur.

e. Recover refrigerant used for leak testing.

2. System Test Pressures

a. Charge system with dry nitrogen and trace of refrigerant (HFC 134A, HFC 407C, or HFC 410A) to 350 psig and retest for leaks with an electronic leak detector. The system must stay at 350 psig pressure for 24 hours to pass the system test pressure test.

b. Release pressure, repair leaks and retest as necessary until no leaks occur.

c. Recover refrigerant used for leak testing.

B. Dehydration

1. Low and Ultra Low Temperature Refrigeration Systems (-30° F to 32° F):

a. Following pressure tests dehydrate each system with a vacuum pump.

b. Draw and hold an initial vacuum of 800 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

c. Draw and hold a second vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.

d. Draw and hold a third vacuum of 250 microns for eight (8) to twelve (12) hours with an allowable maximum rise of 50 microns. Break this third vacuum by adding liquid refrigerant specified for the equipment to the high side of the system (liquid line).

e. Verify vacuum obtained with an electronic vacuum gauge.

2. Medium Temperature Refrigeration Systems (33° F to 55° F), and Air Conditioning Systems:

a. Following pressure tests dehydrate each system with a vacuum pump.
b. Draw and hold an initial vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.
c. Draw and hold a second vacuum of 500 microns. Break this vacuum by pressurizing with dry nitrogen to 10 psig, and change oil in vacuum pump.
d. Verify vacuum obtained with an electronic vacuum gauge.

C. Refrigerant Charging: Follow equipment manufacturer's printed charging directions unless otherwise specified.

1. Introduce refrigerant of type and quantity required through a filter/drier installed in the temporary charging line.

a. Purge small amount of liquid out of the system side of the charging hose.
b. Prevent moisture and other contaminants from entering the system.

2. Charge liquid refrigerant through a charging valve provided in the high pressure side of the system.

a. Small amounts of gaseous refrigerant may be charged through the compressor suction service valve port.

3. No bubbles shall appear at the moisture-liquid indicator when the system is fully charged and operational. Do not overcharge.

4. Record the weight in pounds of refrigerant charged into each system and submit this record to the Director's Representative.

D. Compressor Oil Charge: Pump oil into the compressor after the last vacuum has been preformed. Follow all Manufactures Recommended for oil type and amount to be installed.

E. Adjustments and Operational Testing

1. Adjustments: Place the system in operation with automatic controls functioning. Adjust controls and apparatus for proper operation. Test thermometers and gauges for accuracy over the entire range. Remove and replace items found defective.

a. Check belts, fan blades, fittings, TXV bulbs, and electrical connections for tightness before start up.
b. Check TXV bulb for proper location should be between 8 and 10 o'clock or 2 & 4 o'clock.
c. Seal off all holes in the condition space as specified.
d. Provide a point to point control check of the system to ensure that the specified inputs and outputs are receiving the signal from the proper sensors or controlling the proper device.
e. Set pressure controls and safety controls.
f. Close or de-energize all solenoids, and start up the system.
g. Check that all controls and safety switches are operating properly.
h. Adjust TXV for proper super heat back to the compressors.
i. Clean TXV strainers as many times as required.
j. After one (1) week of run time, change the liquid cores if they are the replaceable type.

k. After one (1) month of run time, replace the liquid cores and compressor suction socks. Replace the liquid cores as required. Clean the TXV's as required.

3.5 DISINFECTION OF POTABLE WATER SYSTEMS

A. Disinfect potable water pipe and equipment installed in the Work of this Contract.

1. Completely fill the piping, including water storage equipment if installed, with a water solution containing 50 mg/L available chlorine, and allow stand for twenty-four (24) hours.

2. Operate all valves during this period to assure their proper disinfection.

3. After the retention period, discharge the solution to an approved waste and flush the system thoroughly with water until substantially all traces of chlorine are removed.

4. Drain and flush water storage equipment if installed.

B. Connect plumbing fixtures and equipment and place the system into service. Prevent recontamination of the piping during this phase of the Work.

END OF SECTION

SECTION 23 0594
TESTING ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required for complete Testing, Adjusting and Balancing of the systems as indicated by the Contract Documents with supplementary items necessary for proper system operation.

B. Equipment included in This Section

a. Air Handling Equipment
b. Exhaust fans
c. Air inlets and outlets
d. Plumbing Equipment
e. Hot water circulation pump
f. Hot water circulation branch balancing valves

1.2 SUBMITTALS

A. Certified TAB reports

1.3 QUALITY ASSURANCES

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, or TABB.

a. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB, or TABB.

b. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.

1.4 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.5 PROJECT CONDITION

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations

1.6 COORDINATION

A. Notice: Provide seven (7) days advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

a. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent

b. Air Outlets and Inlets: Plus or minus 10 percent

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

A. Subject to compliance with requirements, engage one (1) of the following

a. Precision Test and Balance
b. System Management and Balance
c. System Works

3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves.

a. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

b. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design". Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

J. Examine operating safety interlocks and controls on HVAC equipment.

K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

a. Permanent electrical-power wiring is complete.
b. Automatic temperature-control systems are operational.
c. Equipment and duct access doors are securely closed.
d. Isolating and balancing valves are open.
e. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
f. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in this specification and one of the following:

a. AABC's "National Standards for Total System Balance"
b. ASHRAE 111
c. NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems"
d. SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing"

B. Comply with requirements of the adopted version of ASHRAE 62.1, Section on balancing.

C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

   a. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
   b. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation".

D. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

E. Take and report testing and balancing measurements in inch-pound (IP).

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. For variable-air-volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.6 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.7 FINAL REPORT

A. General: Prepare a certified written report;

a. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
b. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

a. Pump curves
b. Fan curves
c. Manufacturers' test data
d. Field test reports prepared by system and equipment installers
e. Other information relative to equipment performance; do not include Shop Drawings and product data

C. General Report Data: In addition to form titles and entries, include the following data:

a. Title page
b. Name and address of the TAB contractor
c. Project name
d. Project location
e. Architect's name and address
f. Engineer's name and address
g. Contractor's name and address
h. Report date
i. Signature of TAB supervisor who certifies the report
j. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
k. Summary of contents including the following:
l. Indicated versus final performance.
m. Notable characteristics of systems.
n. Description of system operation sequence if it varies from the Contract Documents.
o. Nomenclature sheets for each item of equipment.
p. Data for terminal units, including manufacturer's name, type, size, and fittings.
q. Notes to explain why certain final data in the body of reports vary from indicated values.
r. Test conditions for fans and pump performance forms including the following:
s. Settings for outdoor-, return-, and exhaust-air dampers.
t. Conditions of filters.
u. Cooling coil, wet- and dry-bulb conditions.
v. Face and bypass damper settings at coils.

w. Fan drive settings including settings and percentage of maximum pitch diameter.

x. Settings for supply-air, static-pressure controller.

y. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

a. Quantities of exhaust airflows.

b. Water flow rates.

c. Duct, outlet, and inlet sizes.

d. Pipe and valve sizes and locations.

e. Balancing stations.

f. Position of balancing devices.

3.8 INSPECTIONS

A. Initial Inspection

a. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

b. Check the following for each system:

c. Measure airflow of at least ten (10) percent of air outlets.

d. Note deviations from the Contract Documents in the final report.

B. Final Inspection

a. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer.

b. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Construction Manager.

c. Construction Manager shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal eight (8)-hour business day.

d. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

e. If the number of "FAILED" measurements is greater than ten (10) percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

a. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

b. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.9 ADDITIONAL TESTS

A. Within ninety (90) days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 0719
PIPING INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the Piping Insulation indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Pipe Hangers and Supports: Section 230529.

B. Abbreviations

1. K: Thermal Conductivity, i.e., maximum Btu per inch thickness per hour per square foot.

2. pcf: Pounds per cubic foot.

3. PVC: Polyvinylchloride.

1.3 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets and specifications for the following:

1. Insulation Materials.

2. Jacket Materials.

3. Sealant and Adhesive Materials.

1.4 QUALITY ASSURANCE

A. Qualifications: The person(s) directly supervising the installation of this work in the field shall be personally experienced in mechanical insulation work and shall have been regularly employed by a company installing mechanical insulation for a minimum of five (5) years.

B. Regulatory Requirements

1. Insulation installed inside buildings, including laminated jackets, mastics, sealants and adhesives shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

2. Insulation shall meet minimum requirements ASHRAE 90.1-2007.

PART 2 - PRODUCTS

2.1 PIPING INSULATION

A. Fibrous Glass (Mineral Fiber) Insulation: Composed principally of fibers manufactured from rock, slag, or glass, with or without binders, and asbestos free.

1. Preformed Pipe Insulation: Minimum density 3 pcf; ASTM C 547
    a. Class 1 (Suitable for Temperatures Up to 450° F): K of 0.26 at 75° F.
2. Premolded Fitting Insulation: Minimum density 4.0 pcf, K of 0.26 at 75° F; ASTM C 547, Class 1.
3. Insulation Inserts for PVC Fitting Jackets: Minimum density 1.5 pcf, K of 0.28 at 75° F; ASTM C 553, Type III. Suitable for temperatures up to 450° F.

B. Flexible Elastomeric Foam Insulation

1. FM tested and approved, meeting the following:
    a. Maximum Water Vapor Transmission: 0.10 perm - inch based on ASTM E 96, Procedure A.
    b. K of 0.27 at 75° F based on ASTM C 518 or C 177.
2. Pipe Insulation: ASTM C 534, Type I.
3. Polyethylene and polyolefin insulation is not acceptable.

C. High Density Jacketed Insulation Inserts for Hangers and Supports

1. For Use with Fibrous Glass Insulation:
    a. Cold Service Piping:
        1) Polyurethane Foam: Minimum density 4 pcf, K of 0.13 at 75° F, minimum compressive strength of 125 psi.
    b. Hot Service Piping:
        1) Calcium Silicate: Minimum density 15 pcf, K of 0.50 at 300° F; ASTM C 533.
        2) Perlite: Minimum density 12 pcf, K of 0.60 at 300° F; ASTM C 610.
2. For Use with Flexible Elastomeric Foam Insulation: Hardwood dowels and blocks, length or thickness equal to insulation thickness, other dimensions as specified or required.

D. Cements

1. Fibrous Glass Thermal Insulating Cement: Asbestos free; ASTM C 195.
2. Fibrous Glass Hydraulic Setting Thermal Insulating and Finishing Cement: ASTM C 449/C 449M.

2.2 INSULATION JACKETS

A. Laminated Vapor Barrier Jackets for Piping: Factory applied by insulation manufacturer, conforming to ASTM C 1136, Type I.

1. Type I: Reinforced white kraft and aluminum foil laminate with kraft facing out.

    a. Pipe Jackets: Furnished with integral 1-1/2” self sealing longitudinal lap, and separate 3” wide adhesive backed butt strips.

2. Laminated vapor barrier jackets are not required for flexible elastomeric foam insulation.

B. Canvas Jackets: Cotton duck, fire retardant, NFPA 701 compliant, 4 or 6 oz. per square yard as specified.

C. PVC Jackets and Premolded Fitting Covers

1. Constructed of high impact, UV resistant PVC. 0.020” 0.030” thickness.

    a. ASTM D 1784, Class 14253-C.
    b. Working Temperature: 0-150° F.

D. Metal Jacketing

1. Aluminum: ASTM B 209, Alloys 1100, 3003, 3105 or 5005, Temper H14, 0.016 inch thick.

    a. Factory Pre-formed Sectional Pipe Jacketing:
        1) Smooth outer finish with integral bonded laminated polyethylene film, kraft paper moisture barrier underside.
        2) Pittsburgh or modified Pittsburgh longitudinal lock seams.
        3) 2 inch overlapping circumferential joints with integral locking clips, or butt joints sealed with 2 inch wide mastic backed aluminum snap bands.
    b. Fastening Devices:
        1) Strapping: Type 18-8 stainless steel, 0.020” thick, 1/2" and 3/4" wide as specified.
        2) Wing Seals: Type 18-8 stainless steel, 0.032” thick.
        3) Sheet Metal Screws: Panhead, Type A, hardened aluminum, and stainless steel.

2. Circumferentially Corrugated Aluminum Jacketing: Childer’s Corrolon, or Prior Approved Equal.

    a. Construction: 3/16” circumferentially corrugated embossed aluminum, ASTM B 209, Types 1100, 3003, 3105, or 505, H-14 temper, 0.016” thick.
    b. Moisture Barrier: Integrally bonded to jacket over entire surface in contact with insulation.
    c. Fastening Devices:
        1) Strapping: 0.020” thick by 1/2" wide, Type 3003, 3105, 5005, H-14 temper.
        2) Wing Seals: 0.032” thick Type 5005, H-14 temper aluminum.

E. Insulated Safety Wrap: Handi Lav-Guard by Truebro Inc., or Prior Approved Equal.

1. Construction: 1/8” thick chemical resistant vinyl with internal ribs.

2. Fasteners: Nylon tie laces or reuseable clips.

3. Kit includes covering for 8” tailpiece, P trap, 8” waste arm, hot and cold lines and valves, and required fasteners.

F. Removable Insulation Covers: Advance Thermal Corp., or Prior Approved Equal.

1. Construction: Teflon or silicon coated canvas blanket. Insulation shall match insulation thickness or be as thick as possible.

2. Fasteners: A minimum of Velcro, double-loop d-rings, and laces.

3. Use materials that are rated for an application's specific temperature requirements, e.g. use high temperature (800° F) rated products for generator exhaust flues.

2.3 ADHESIVES, MASTICS, AND SEALERS

A. Adhesives

1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).

2. Calcium silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 - 800° F (10 - 427° C).

3. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive with a service temperature range of -75°F to +300°F (-59°C to +149°C)

4. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

5. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

6. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

7. PVC Jacket Adhesive: Compatible with PVC jacket.

B. Mastics

1. For indoor applications, use mastics that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).

2. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

C. Lagging Adhesives

1. For indoor applications, use adhesive that has a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).

2. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

D. Sealants

1. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D(EPA Method 24).

2. Vapor Seal Adhesive (Fibrous Glass Insulation): Childers' CP-82, Epolux's Cadoprene 400, Foster's 85-75 or 85-20.

3. Vapor Barrier Mastic/Joint Sealer (Fibrous Glass Insulation): Childers' CP-30, Epolux's Cadalar 670, Foster's 95-44 or 30-35.

4. Adhesive (Flexible Elastomeric Foam): Armstrong's 520, Childers' CP-80, Epolux's Cadoprene 488, Foster's 82-40.

5. Sealant (Metal Pipe Jacket): One-part silicone sealant for high temperatures; Dow Corning's Silastic 736 RTV or General Electric's RTV 106.

2.4 MISCELLANEOUS MATERIALS

A. Pressure Sensitive Tape for Sealing Laminated Jackets:

1. Acceptable Manufacturers:

a. Alpha Associates
b. Childers
c. Ideal Tape
d. Morgan Adhesive

2. Type: Same construction as jacket.

B. Wire, Bands, and Wire Mesh:

1. Binding and Lacing Wire: Nickel copper alloy or copper clad steel, gauge as specified.

2. Bands: Galvanized steel, 1/2" wide x 0.015" thick, with 0.032" thick galvanized wing seals.

3. Wire Mesh: Woven 20-gauge steel wire with 1" hexagonal openings, galvanized after weaving.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform the following before starting insulation Work:

1. Install hangers, supports and appurtenances in their permanent locations.

2. Complete testing of piping.

3. Clean and dry surfaces to be insulated.

3.2 INSTALLATION, GENERAL

A. Install the Work of this Section in accordance with the manufacturer's printed installation instructions unless otherwise specified.

B. Provide continuous piping insulation and jacketing when passing thru interior wall, floor, and ceiling construction.

1. At Through Penetration Firestops: Coordinate insulation densities with the requirements of approved firestop system being installed. See Section 078400.

a. Insulation densities required by approved firestop system may vary with the densities specified in this Section. When this occurs use the higher density insulation.

C. Do not intermix different insulation materials on individual runs of piping.

3.3 INSTALLATION AT HANGERS AND SUPPORTS

A. Reset and realign hangers and supports if they are displaced while installing insulation.

B. Install high density jacketed insulation inserts at hangers and supports for insulated piping.

C. Insulation Inserts For Use with Fibrous Glass Insulation

1. Where clevis hangers are used, install insulation shields and high density jacketed insulation inserts between shield and pipe.

a. Where insulation is subject to compression at points over 180° apart, e.g. riser clamps, U-bolts, trapezes, etc.; fully encircle pipe with two (2) protection shields and two (2) high density jacketed fibrous glass insulation inserts within supporting members.

D. Insulation Inserts For Use with Flexible Elastomeric Foam Insulation:

1. Where clevis hangers are used, install insulation shields with hardwood filler pieces, same thickness as adjoining insulation, inserted in undersized die cut or slotted holes in insulation at support points.

2. Contour hardwood blocks to match the curvature of pipe, and shield.

3. Coat dowels and blocks with insulation adhesive, and insert while still wet.

4. Vapor seal outer surfaces of dowels and blocks with adhesive after insertion.

5. Install filler pieces as follows:

PIPE/TUBING SIZE	FILLER PIECES	POSITION
Thru 1-1/2”	2 dowel plugs	6 o’clock; in tandem
2” thru 4”	1 block, 2 dowel plugs	6 o’clock, and 4 & 8 o’clock respectively
6” thru 8”	2 blocks, 4 dowel plugs	6 o’clock; in tandem and 4 & 8 o’clock; in tandem

3.4 INSTALLATION OF FIBROUS GLASS COLD SERVICE INSULATION

A. Install insulation materials with a field or factory applied ASTM C 1136 Type I laminated vapor barrier jacket, unless otherwise specified.

B. Piping

1. Butt insulation joints together, continuously seal minimum 1-1/2" wide self-sealing longitudinal jacket laps and 3" wide butt adhesive backed strips.

   a. Substitution: 3" wide pressure sensitive sealing tape, of same material as jacket, may be used in lieu of butt strips.

2. Bed insulation in a 2" wide band of vapor barrier mastic, and vapor seal exposed ends of insulation with vapor barrier mastic at each butt joint between pipe insulation and equipment, fittings or flanges at the following intervals:

   a. Horizontal Pipe Runs: 21 ft.
   b. Vertical Pipe Runs: 9 ft.

C. Fittings, Valves, Flanges and Irregular Surfaces

1. Piping Systems (less than 40° F)

   a. Insulate with mitre cut or pre-molded fitting insulation of same material and thickness as pipe insulation.
   b. Secure insulation in place with 16-gauge wire, with ends twisted and turned down into insulation.
   c. Butt insulation against pipe insulation and bond with joint sealer.
   d. Insulate valves up to and including bonnets, without interfering with packing nuts.
   e. Insulate pump impeller casings on pump systems operating below 45° F.
   f. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.
   g. When insulating cement has dried, seal fitting, valve and flange insulation, by imbedding a layer of reinforcing membrane between two (2) flood coats of vapor barrier mastic, each 1/8" thick wet.
   h. Lap reinforcing membrane or canvas on itself and adjoining pipe insulation at least 2 inches.
   i. Trowel, brush or rubber glove outside coat over entire insulated surface.

2. Piping Systems (40 - 60° F)

   a. Valves, fittings and flanges shall be insulated with pre-molded PVC fitting jackets, with fibrous glass insulation inserts.
      1) Additional insulation inserts are required for services with operating temperatures under 45° F or where insulation thickness exceeds 1-1/2". The surface temperature of PVC fitting jacket must not go below 45° F.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC FOAM INSULATION

A. Where possible, slip insulation over the pipe, and seal butt joints with adhesive.

1. Where the slip-on technique is not possible, slit the insulation and install.

2. Re-seal with adhesive, making sure the mating surfaces are completely joined.

B. Insulate fittings and valves with miter cut sections. Use templates provided by the manufacturer, and assemble the cut sections in accordance with the manufacturer's printed instructions.

1. Insulate threaded fittings and valves with sleeved fitting covers. Overlap and seal the covers to the adjoining pipe insulation with adhesive.

C. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.

D. Piping Exposed Exterior to a Building, Totally Exposed to the Elements:

1. Apply flexible elastomeric foam insulation to piping with adhesive.

2. Apply reinforcing membrane around piping insulation with adhesive or mastic.

3. Adhesive Applied System: Apply two (2) coats of finish.

4. Mastic Applied System: Apply another coat of mastic over reinforcing membrane.

3.6 INSTALLATION OF PVC JACKETING ON PIPING

A. Secure jacketing to insulated piping and seal with adhesive. All seams shall be secured flat.

B. Jacket fittings with preformed covers.

3.7 INSTALLATION OF METAL JACKETING ON PIPING

A. Secure jacketing to insulated piping with preformed aluminum snap straps and stainless steel strapping installed with special banding wrench.

B. Jacket fittings, valves and flanges with mitred sections of aluminum jacketing.

1. Seal joints with sealant and secure with preformed aluminum bands.

2. Factory fabricated, preformed, sectional aluminum fitting covers may be used in lieu of mitred sections of aluminum jacketing for covering fittings, valves and flanges.

3.8 INSTALLATION OF REMOVABLE INSULATION COVERS

A. Install Removable Insulation Covers in lieu of field applied insulation on the following items:

1. Steam pressure reducing valve stations. Insulate all non-field insulated surfaces of valve assembly.

2. Generator exhaust piping from generator to silencer.

3. Heating water and steam condensate return pumps.

4. Uninsulated headers of shell-and-tube heat exchangers.

5. Steam boiler gate and non-return valves.

6. Control valves 4” and over.

3.9 FIELD QUALITY CONTROL

A. Field Samples: The Owner’s Representative, may at his discretion, take field samples of installed insulation for the purpose of checking materials and application. Contractor shall reinsulate sample cut areas.

3.10 PIPING INSULATION SCHEDULE

A. Refer to Drawings for piping application schedule.

B. Insulate all cold service and hot service piping, and appurtenances except where otherwise specified.

C. Schedule of items not to be insulated:

1. Do not insulate the following items:

   a. Actual heat transfer surfaces.
   b. Chromium plated piping, unless otherwise specified.
   c. Flexible vibration eliminators.
   d. Water meters.
   e. Drains from heating equipment and appurtenances that flow to waste.
   f. Chemical feed piping.
   g. Piping inside convector and finned tube radiation enclosures.
   h. Boiler blow-off and blow-down piping.
   i. Safety and relief valves. Discharge piping from relief valves.
   j. Vent piping to atmosphere installed exposed in Mechanical Rooms, connected to the following: Blow-off tanks, flash tanks, condensate tanks.
   k. Flanges and unions in piping systems over 140° F.
   l. Hydronic Specialties: Flow indicators, control valves 3” and under, air vents and air control fittings.
   m. Steam traps and cooling legs of steam traps.
   n. Float chambers and level controllers.

2. Do not insulate mechanical equipment with a factory applied insulated steel jacket, unless specified otherwise.

3.11 INSULATION MATERIAL SCHEDULE

A. Notes

1. Cold Condensate Drain Piping: Insulate with same materials and thicknesses specified for domestic cold water.

   a. Piping connected to drain pans under cooling coils within unit enclosure, except where over drain pans.
   b. Horizontal condensate drain piping outside unit enclosures.
   c. Vertical condensate drain piping of less than one (1) story immediately following horizontal run.

2. Piping Serving Handicapped Accessible Lavatories:

   a. Insulate exposed hot and cold water supply, and waste piping with insulated safety

wrap. Install fasteners thru each pair of holes in insulated safety wrap.

3.12 SCHEDULE OF METAL JACKETING FOR INSULATED PIPE

A. Jacket exposed insulated risers with preformed sectional aluminum metal jacketing, in piping systems with service temperatures 105-450° F, installed in finished rooms or finished spaces above Basement Floor Level.

1. Exception: Preformed sectional aluminum metal jacketing is not required on piping in Mechanical Equipment Rooms, Steam Service Rooms, Penthouse, Mechanical Equipment Rooms and Machine Rooms.

B. Install jacketing from floor to ceiling or from floor to first change of direction in riser, when such change in direction is a minimum of 9'-0" above finished floor, whichever is applicable.

C. Piping Exterior to Building: Jacket insulated piping with circumferentially corrugated aluminum jacketing.

1. Lap longitudinal and circumferential joints a minimum of 2".

2. Secure jacketing in place with 1/2" x 0.020" thick aluminum bands secured with aluminum wing type seals, on maximum 12" centers.

3. Cover insulated fittings, valves, and offsets with mitered sections of jacketing. Seal joints with mastic, and secure with aluminum strapping and wing seals.

4. Factory fabricated, preformed fitting covers of same material as jacketing may be used instead of mitered jacketing.

5. Install jacketing so as to avoid trapping condensation and precipitation.

3.13 SCHEDULE OF PVC JACKETING FOR INSULATED PIPE

A. For exposed piping, install jacketing from floor to ceiling or from floor to first change of direction in riser, when such change in direction is a minimum of 9'-0" above finished floor, whichever is applicable.

B. Jacket exposed insulated piping in mechanical rooms and tunnels with PVC jacketing.

3.14 SCHEDULE OF ALUMINUM JACKETING FOR INSULATED PIPE

A. Jacket exposed insulated piping on roof with aluminum jacketing.

3.15 SCHEDULE OF PIPING COLORS

A. Paint all new and existing piping in the remodeled mechanical rooms the following colors:

SERVICE	JACKET MATERIAL	COLOR
Chilled Water	PVC	Light Blue
Heating Water	PVC	Light Green
Condenser Water	None	Light Grey
Steam	PVC/Canvas	Red

Condensate	PVC/Canvas	Dark Grey
Gas	None	Orange
Fuel Oil	None	Pink
Cold Water	PVC	Dark Blue
Hot Water	PVC	Yellow
Hot Water Circ	PVC	Tan

Notes:

1. Piping with PVC jacketing may have color jacketing in lieu of paint.

END OF SECTION

SECTION 23 1126
NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Natural gas Piping System indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Piping
2. Regulators
3. Unions
4. Valves

1.2 REFERENCES

A. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. Adopted version of the International Fuel Gas Code.
2. Adopted version of NFPA 54, National Fuel Gas Code.
3. ASME as it pertains to the welding of piping.
4. State Boiler Code

1.3 SUBMITTALS

A. Product Data

1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.
2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.

B. Submit piping layout drawings as per Section 230500.

1.4 QUALITY ASSURANCE

A. All materials, equipment and Work shall meet or exceed all applicable federal, state and local requirements and conform to codes and ordinances of authorities having jurisdiction.

B. Valves: Manufacturer's name, size, standards compliance and pressure rating clearly marked on outside of valve body.

C. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

E. Installer Qualifications: Company specializing in performing the Work of this Section with minimum three (3) years documented experience. All installation shall be supervised by a licensed Master Plumber. All testing shall be performed by a licensed Journeyman or Master Plumber. Welders shall be certified in accordance with ASME.

1.5 EXTRA MATERIALS

A. Provide one (1) plug valve wrench for every ten (10) plug valves sized 2 inches and smaller, minimum of one (1). Provide each plug valve sized 2-1/2 inches and larger with a wrench incorporating a setscrew.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Natural gas pressures shall not exceed two (2) pounds per square inch gauge on customer side of the meter.

C. Pipe joint compound shall be lead-free, non-toxic, non-hardening, insoluble in the presence of natural gas and compliant with ANSI/NSF 61 and Federal Specification TT-S-1732. Temperature service range of -15° F to +400° F.

2.2 PIPING

A. Steel Piping

1. Schedule 40 black steel, ASTM A53, Grade A or B, seamless or electric resistance welded.
    a. Malleable Iron, Steam Pattern Threaded Fittings
        1) 150 lb Class: ASME B16.3
    b. Schedule 40 Carbon Steel Fittings
        1) ASME B16.9

2.3 EXCEPTIONS

A. All piping distributed within the building and above 5 psi is required to be welded.

B. Gas piping is prohibited from being installed in solid partitions or walls unless a chase or casing (pipe sleeve) is provided.

C. Threaded fittings shall not be used for pipe sizes 4 inches and larger.

2.4 VALVES

A. Acceptable Manufacturers:

1. A.Y. McDonald
2. Nibco
3. Milwaukee
4. Nordstrom
5. Mueller.

B. All valves shall be designed, manufactured and approved for natural gas service.

C. Line Shut-off Valves sizes 2" and smaller:

1. Iron body lubricated plug valve conforming to ASME B16.33, U.L. Listed, and A.G.A. Approved for natural gas service with threaded ends, wrench operation, rated for 200 WOG service pressure and –20 to 200° F.
2. Brass body, full port ball valve conforming to ASME B16.33, U.L. Listed, F.M. Approved. Blowout-proof stem and PTFE seats. Approved for natural gas service up to and including 5 psig with threaded ends, rated for 125 psig working pressure and -4 to 200°F working temperature.

D. Line Shut-off Valves sizes 2 1/2" and larger:

1. Iron body lubricated plug valve conforming to ASME B16.44, U.L. Listed, and A.G.A. Approved for natural gas service with flanged ends, wrench operation, rated for 200 WOG service pressure and –20 to 200° F.
2. Brass body, full port ball valve (2-1/2" – 4") conforming to ASME B16.44 and U.L. Listed. Blowout-proof stem and PTFE seats. Approved for natural gas service up to and including 5 psig with threaded ends, rated for 250 psig working pressure and -4 to 200°F working temperature.

E. Appliance/Equipment Shut-off Valves at local connections sizes two (2) inches and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed, and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275° F.

2.5 PRESSURE REGULATORS

A. Acceptable Manufacturers:

1. Fisher
2. Maxitrol
3. Rockwell

4. Schlumberger.

B. All pressure regulators shall be designed, manufactured and approved for natural gas service.

C. Pressure regulators for individual service lines shall be capable of reducing distribution line pressure to pressures required for equipment. Pressure relief shall be set at a lower pressure than would cause unsafe operation of any connected unit. Regulator shall have a single port with orifice diameter no greater than that recommended by manufacturer for the maximum gas pressure at the regulator inlet. Regulator vent valve shall be of resilient materials designed to withstand flow conditions when pressed against valve port. Regulator shall be capable of limiting build-up of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Commercial grade diaphragm type with internal relief valve, vent valve, cast iron body, Buna-N diaphragm.

D. Install pressure gauge adjacent to and downstream of each line pressure regulator.

2.6 UNIONS

A. Unions in 2” and smaller in ferrous lines shall be Class 300 AAR malleable iron unions with iron to brass seats, 2-1/2” and larger shall be ground flange unions. Companion flanges on lines at various items of equipment, machines and pieces of apparatus may serve as unions to permit disconnection of piping.

B. Unions connecting ferrous pipe to copper or brass pipe shall be Epco dielectric type.

C. Above grade flexible stainless steel appliance/equipment connectors shall conform with AGA under the ANSI Z21.69 Standard. Hose shall be braided stainless steel with a polyolefin heat-shrink tubing with high flame-retardant qualities. Hose shall be equipped with malleable iron unions and spring loaded brass quick-link couplings. An easily accessible manual shut-off valve shall be installed ahead of all hose connections. Specify T&S Brass "Safe-T-Link" or approved equal.

2.7 FLANGES

A. All 150 lb. and 300 lb. ANSI flanges shall be domestically manufactured, weld neck forged carbon steel, conforming to ANSI B16.5 and ASTM A-181 Grade I or II or A-105-71. Slip on flanges shall not be used.

B. Each fitting shall be stamped as specified by ANSI B16.9 and, in addition, shall have the laboratory control number stenciled on each fitting for ready reference as to physical properties and chemical composition of the material. Complete test reports may be required for any fitting selected at random.

C. Flanges which have been machined, remarked, painted or otherwise produced domestically from imported forges will not be acceptable. Flanges shall have the manufacturer’s trademark permanently identified in accordance with MSS SP-25.

D. Bolts used shall be carbon steel bolts with semi-finished hexagon nuts of American Standard Heavy dimensions. Threaded rods will not be an acceptable alternate for flange bolts. Bolts shall have a tensile strength of 60,000 psi and an elastic limit of 30,000 psi.

E. Flat-faced flanges shall be required to match flanges on pumps, check valves, strainers, etc. Only one (1) manufacturer of weld flanges will be approved for each project.

F. All flanges shall be gasketed. Contractor shall place gasket between flanges of flanged joints. Gaskets shall fit within the bolt circle on raised face flanges and shall be full face on flat face flanges. Gaskets shall be cut from 1/16” thick, non metallic, non asbestos gasket material suitable for operating temperatures from -150° F to +75° F.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Accept piping, fittings, and accessories on Site in shipping containers with labeling in place, inspect for damage and store with a minimum of handling. Store plastic piping under cover out of direct sunlight. Do not store materials directly on the ground.

B. Provide temporary protective coating on all cast iron and steel devices.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

3.2 PREPARATION

A. Ream pipe ends and remove cutting burrs. Bevel plain end ferrous pipe.

B. Remove cutting oil, scale and dirt, on inside and outside of piping, before assembly.

3.3 PAINTING

A. Prepare all piping as needed to allow for proper coverage and adherence.

B. Piping to be painted includes the following:

1. Exterior to building: Color selected by Architect.

2. Interior to building: Yellow

3. Extension of existing system: Match existing color

3.4 EQUIPMENT CONNECTIONS

A. Provide specified connections, shutoff valves, regulators and unions at each and every appliance and piece of equipment requiring natural gas, including equipment furnished under other Divisions of these Specifications and/or by the Owner.

B. Provide and install union type connections at all equipment to permit removal of service piping.

C. Gas service connections shall have a diameter at least one (1) pipe size larger than that of the inlet connection to the equipment as provided by the manufacturer and be of adequate size to provide the total input demand of the connected equipment.

D. Provide listed and labeled appliance connectors complying with ANSI Z21.69 and listed for use with food service equipment having casters, or that is otherwise subject to movement for cleaning, and other large movable equipment. Connectors shall have listed and labeled quick-disconnect devices and shall have retaining cables attached to structures and equipment. Connectors shall not be concealed within or extended through wall, floor or partition and shall be located entirely in the same room as the connected equipment. Provide an accessible shut-off valve not less than the nominal size of the equipment connector, immediately ahead of the connector.

E. Rigid metallic pipe and fittings shall be used at service connections to all permanently stationary equipment.

3.5 INSTALLATION - GENERAL

A. All gas piping installed in return air plenums shall be welded.

B. Valves shall not be installed in concealed locations and return air plenums.

C. Line shutoff valves installed exterior to the building shall be plug valves. Line shutoff valves installed interior to the building shall be full-port ball valves.

D. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

E. All installation shall be in accordance with manufacturer's published recommendations.

F. Provide support for and connections to natural gas service meter in accordance with requirements of the utility company.

G. All installation shall be in accordance with manufacturer's published recommendations.

H. All above ground gas piping shall be electrically continuous and bonded to electrical system ground conductor in accordance with NFPA 70.

I. Provide and install unions at proper points to permit dismantling or removal of pipe. No unions will be required in welded lines except at equipment connections.

J. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment, such as dielectric union, coupling or dielectric flange fitting.

K. Valves, regulators, flanges, unions and similar appurtenances shall be accessible for operation and servicing and shall not be located above ceilings in accessible locations or within partitions.

L. Route piping in orderly manner and maintain gradient. Install piping to conserve building space. Group piping whenever practical at common elevations.

M. Install piping to allow for expansion and Contraction without stressing pipe, joints, or connected equipment.

N. Make service connections at the top of the main, whenever the depth of the main is sufficient to allow top connections. When service connections cannot be made at the top of the main, they shall be made on the side of the main no lower than the horizontal midpoint of the gas main.

O. Cross type fittings shall not be installed in any gas line. Bushings shall not be used in conjunction with any gas piping.

P. Slope piping and arrange to drain at low points. Install drip/sediment traps at points where condensate and debris may collect. Locate drip/sediment traps where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing. Construct drip/sediment traps using tee fitting with capped nipple connected to bottom outlet. Use minimum-length nipple of three (3) pipe diameters, but not less than 4 inches long, and same size as connected pipe. Cap shall be screwed pattern, black, standard weight, malleable iron. Install with adequate space for removal of cap.

Q. Install valves for shut off and to isolate equipment, parts of systems, or vertical risers. All valves shall be located such that servicing and operation is possible. All flanged valves shown in horizontal lines with the valve stem shall be positioned so that the valve stem is inclined one bolt hole above the horizontal position. Screw pattern valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. All valves must be true and straight at the time the system is tested and inspected for final acceptance. Valves shall be installed as nearly as possible to the locations indicated in the Contract Drawings. Any change in valve location must be so indicated on the Record Drawings.

R. Install line shut-off valve at each branch connection to riser. Branch line shut-off valves shall be automatic type where indicated on Drawings.

S. Provide adequate clearance for access to and operation of all valves.

T. Install valves with stems upright or horizontal, not inverted unless required otherwise by the valve manufacturer.

U. Above ground horizontal natural gas and encasement piping shall be supported at intervals of no greater than 6 foot for 1/2" piping, 8 foot for 3/4" and 1” piping and 10 foot for 1-1/4” and larger piping. Vertical piping shall be supported at each floor level and at intervals as specified for horizontal piping.

V. Extension bars shall not be used for supporting gas or encasement piping. Gas or encasement piping shall not be used to support any other piping or component.

3.6 TESTING

A. All natural gas systems shall be inspected, tested, purged and placed into operation in accordance with NFPA 54 and as required herein.

B. All natural gas piping systems shall be very carefully inspected, tested, purged and placed into operation by a Licensed Plumber.

C. All necessary apparatus for conducting tests shall be furnished by the Contractor and comply with the requirements of NFPA 54.

D. All new rough-in distribution piping and affected portions of existing systems connected to, shall be subjected to a pneumatic test pressure utilizing clean, dry air and must be demonstrated to be absolutely tight when subjected to the pressures and time durations listed herein. All equipment and components designed for operating pressures of less than the test pressure shall not be connected to the piping system during test.

E. Systems on which the normal operating pressure is less than 0.5 pounds per square inch gauge (psig), the test pressure shall be 5.0 psig and the time interval shall be thirty (30) minutes.

F. Systems on which the normal operating pressure is between 0.5 psig and 5.0 psig, the test pressure shall be 1.5 times the normal operating pressure or 5.0 psig, whichever is greater, and the time interval shall be thirty (30) minutes.

G. Systems on which the normal operating pressure is 5.0 psig or greater, the test pressure shall be 1.5 times the normal operating pressure, and the time interval shall be one (1) hour.

H. After testing is complete, the entire gas system shall be purged with dry nitrogen to eliminate all air, debris and moisture from the piping before natural gas is introduced into the system.

I. After successful results of pressure test and purging have been completed, a leakage test shall be performed in accordance with NFPA 54 Appendix D.

J. Connect, inspect and purge gas utilization equipment, lab hook-ups, outlets, etc., and place into operation only after successful results of pressure test, leakage test and purging have been completed and accepted.

K. In all instances in which leaks are then found, they shall be eliminated. Testing operations shall be repeated until gas-piping systems are absolutely tight at the pneumatic test pressures indicated above.

L. Pressure test gas piping sleeve system with clean, dry compressed air at 15 psig by temporarily sealing all openings between gas carrier pipe and sleeve and vent openings. Sleeve systems must be demonstrated to be absolutely tight when subjected to this pressure for a period of four (4) hours.

END OF SECTION

SECTION 23 2300
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the Refrigerant Piping indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section
   a. Piping
   b. Equipment
   c. Valves
   d. Accessories
   e. Specialties

1.2 REFERENCES

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.3 SUBMITTALS

A. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

   1. Refrigerant piping indicated on Drawings is schematic only.

   2. Size piping and design actual piping layout, including oil traps, double risers, and specialties. Coordinate the number of circuits, required pipe and tube sizes as needed to accommodate the provided cooling coils and condensing units.

   3. Verify the equipment to be provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.4 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-134a

1. Suction Lines for Air-Conditioning Applications: 115 psig
2. Suction Lines for Heat-Pump Applications: 225 psig
3. Hot-Gas and Liquid Lines: 225 psig

B. Line Test Pressure for Refrigerant R-404A

1. Suction Lines for Air-Conditioning Applications: 240 psig
2. Suction Lines for Heat-Pump Applications: 400 psig
3. Hot-Gas and Liquid Lines: 400 psig

C. Line Test Pressure for Refrigerant R-407C

1. Suction Lines for Air-Conditioning Applications: 230 psig
2. Suction Lines for Heat-Pump Applications: 380 psig
3. Hot-Gas and Liquid Lines: 380 psig

D. Line Test Pressure for Refrigerant R-410A

1. Suction Lines for Air-Conditioning Applications: 300 psig
2. Suction Lines for Heat-Pump Applications: 535 psig
3. Hot-Gas and Liquid Lines: 535 psig

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

A. Copper Tube and Fittings

1. Copper Tube: ASTM B 280, Type ACR
2. Wrought-Copper Fittings: ASME B16.22
3. Wrought-Copper Unions: ASME B16.22
4. Silver Solder: Cadmium-free high-silver alloy consisting of at least 45% silver
5. Brazing Filler Metals: Phosphorus/copper/silver alloy consisting of 15% silver

B. Flexible Connectors

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket

2. End Connections: Socket ends

3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly

4. Pressure Rating: Factory test at minimum 500 psig

5. Maximum Operating Temperature: 250° F

2.2 VALVES AND SPECIALTIES

A. Provide all necessary valves and specialties as needed to provide an operational system. Components may include the following items:

1. Diaphragm Packless Valves

2. Packed-Angle Valves

3. Check Valves

4. Service Valves

5. Solenoid Valves

6. Safety Relief Valves

7. Thermostatic Expansion Valves

8. Hot-Gas Bypass Valves

9. Strainers

10. Moisture/Liquid Indicators

11. Replaceable-Core Filter Dryers

12. Permanent Filter Dryers

13. Mufflers

14. Receivers

15. Liquid Accumulators

B. Coordinate refrigerant system configuration with equipment manufacturer.

2.3 REFRIGERANTS

A. The following refrigerants are acceptable for comfort cooling related systems.

1. ASHRAE 34, R-134a: Tetrafluoroethane

2. ASHRAE 34, R-404A

3. ASHRAE 34, R-407C: Difluoromethane/Pentafluoroethane/1,1,1,2-Tetrafluoroethane

4. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines for Conventional Air-Conditioning Applications: Copper, Type L or ACR, drawn-temper tubing and wrought-copper fittings with brazed or silver soldered joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L or ACR, drawn-temper tubing and wrought-copper fittings with brazed or silver soldered joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type L or ACR, drawn-temper tubing and wrought-copper fittings with brazed or silver soldered joints.

3.2 SYSTEM CONSTRAINTS

A. Install a full-sized, three (3)-valve bypass around filter dryers and all equipment that require routine servicing.

B. Design refrigeration system to operate at an ambient temperature of 95˚F 105˚F and a minimum outside air temperature of 30˚F 0˚F -20˚F.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Arrange piping to allow inspection and service of refrigeration equipment.

H. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels if valves or equipment requiring maintenance is concealed behind finished surfaces.

I. Install refrigerant piping in protective conduit where installed belowground.

J. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

K. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor.

3. Use double-suction riser for maximum compressor efficiencies if load variation is expected.

4. Install traps and double risers to entrain oil in vertical runs.

5. Liquid lines may be installed level.

L. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

N. Install sleeves for piping penetrations of walls, ceilings, and floors.

O. Install sleeve seals for piping penetrations of concrete walls and slabs.

P. Install escutcheons for piping penetrations of walls, ceilings, and floors.

Q. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

R. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.

2. Thermostatic expansion valves.

3. Hot-gas bypass valves.

4. Compressor.

S. Install flexible connectors at compressors.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections

1. Comply with ASME.

2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

   a. Fill system with nitrogen to the required test pressure.
   b. System shall maintain test pressure at the manifold gage throughout duration of test.
   c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
   d. Remake leaking joints using new materials and retest until satisfactory results are achieved.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers or manufacturers' required level. If vacuum holds for twelve (12) hours, system is ready for charging.

3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

4. Charge system with a new filter-dryer core in charging line.

3.7 ADJUSTING

A. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

B. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.

2. Verify that compressor oil level is correct.

3. Open compressor suction and discharge valves.

4. Open refrigerant valves except bypass valves that are used for other purposes.

5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

D. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 3113
METAL DUCTWORK

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the Ductwork Insulation indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. National Fire Protection Association (NFPA)

B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

C. Definition

1. Low Pressure

a. 2 inch W.G. Pressure Class: Ductwork systems up to 2 inch w.g. positive or negative static pressure with velocities less than or equal to 1500 fpm.

2. Medium Pressure

a. 3 inch W.G. Pressure Class: Ductwork systems over 2 inch w.g. and up to 3 inch W.G. positive or negative static pressure with velocities less than or equal to 2500 fpm.
b. 4 inch W.G. Pressure Class: Ductwork systems over 3 inch w.g. and up to 4 inch w.g. positive or negative static pressure with velocities less than or equal to 2500 fpm.
c. 6 inch W.G. Pressure Class: Ductwork systems over 4 inch w.g. and up to 6 inch w.g. positive or negative static pressure with velocities less than or equal to 2500 fpm.

1.3 SUBMITTALS

A. Shop Drawings

1. Layouts for areas in which it may be necessary to deviate substantially from layout shown on the Drawings. Show major relocation of ductwork and major changes in size of ducts. Minor transitions in ductwork, if required due to job conditions, need not be submitted as long as the duct area is maintained.

2. Details of intermediate structural steel members required to span main structural steel for the support of ductwork.

3. Method of attachment of duct hangers to building construction.

B. Coordinate shop drawings with related contractors prior to submission.

C. Product Data: Material, gauge, type of joints, sealing materials, and reinforcing for each duct size range, including sketches or SMACNA plate numbers for joints, method of fabrication and reinforcing. Include ACGIH figure numbers for hoods if applicable.

1.4 QUALITY ASSURANCE

A. SMACNA: Gauges of materials, fabrication, reinforcement, sealing requirements, installation, and method of supporting ductwork shall be in accordance with the following SMACNA manuals, unless otherwise shown or specified:

1. HVAC Duct Construction Standards

2. Round Industrial Duct Construction Standard

3. Rectangular Industrial Duct Construction Standard

B. Unless otherwise shown or specified, follow the Hood Design Data, and Construction Guidelines for Local Exhaust Systems from the ACGIH Industrial Ventilation Manual.

C. Conform to the applicable requirements of NFPA 90A, 90B, 91, 96, and 101.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet Metal

1. Aluminum: ASTMB-209, Alloy 3003, Temper H-14.

2. Galvanized Steel: ASTM A653, Class LFQ (lock forming quality), coating designation G-60.

B. Duct Hangers

1. Strap Hangers: Same material as ducts, except that hangers for stainless steel ducts in unfinished spaces may be galvanized steel.

2. Rod Type Hangers: Mild low carbon steel, unless otherwise specified; fully threaded or threaded each end, with 2 removable nuts each end for positioning and locking rod in place. Unless stainless steel, galvanized or cadmium plated; shop coat with metal primer.

C. Miscellaneous Fasteners and Upper Hanger Attachments

1. Sheet Metal Screws, Machine Bolts and Nuts: Same material as duct, unless otherwise specified.

2. Concrete Inserts: Steel or malleable iron, galvanized; continuously slotted or individual inserts conforming with MSS SP-58, Types 18 & 19, Class A-B.

3. C Clamps: Fee & Mason Co.'s 255L with locking nut, and 255S with retaining strap.

4. Metal Deck Ceiling Bolts: B-Line Systems, Inc.'s Fig. B3019.

5. Welding Studs: Erico Fastening Systems, capacitor discharge, low carbon steel, copper flashed.

6. Structural (carbon) Steel Shapes and Steel Plates: ASTM A36, shop primed.

7. Stainless Steel Shapes and Plates: ASTM A276 and ASTM A666.

8. Machine Bolt Expansion Anchors

   a. Non-caulking single unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 1.
   b. Non-caulking double unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 2.
   c. Self-drilling type: FS FF-S-325, Group III, Types 1 and 2.

2.2 FABRICATION – GENERAL

A. Refer to the ductwork application schedule on the drawings for the types and material usage for the various ductwork types required.

B. Duct sizes shown on the Drawings are inside clear dimensions available for air movement. Verify with duct construction method to determine exterior dimensions for layout and fabrication purposes.

C. Fabricate all exhaust ductwork from aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install ductwork to allow maximum headroom. Properly seam, brace, stiffen, support, and render ducts mechanically airtight. Adjust ducts to suit job conditions. Dimensions may be changed as approved if cross sectional area is maintained.

B. Provide necessary transformation pieces, and flexible fabric connections for ductwork connected to air handling equipment or air inlet and outlet devices. Flexible fabric connections installed at equipment exterior to the building shall be rated for UV exposure and suitable for exterior use per ASTM G155 leasing requirements. Metal for these connections shall be aluminum or stainless steel, galvanized connections shall not be allowed.

3.2 SEALING SEAMS, JOINTS, AND PENETRATIONS

A. Seal ductwork in accordance with the SMACNA Manual except for the following:

1. Ductwork Specified to be Insulated: Conform with Seal Class A for all pressure classes.

2. Cooking Equipment Exhaust Ductwork: Conform with NFPA 96.

3. Exhaust ductwork joints shall not use sheetmetal screws or other fasteners that protrude into the ductwork to catch lint and debris. Ducts shall insert and adjoin to the next duct or fitting in the direction of airflow. Seal all joints and seams vapor tight with ductwork foil tape.

   a. Commercial dryers or dryer exhaust systems serving multiple appliances shall utilize flanged and gasketed connections.

3.3 HANGERS FOR DUCTS, UNDER 2 INCHES W.G.

A. Install hangers for ducts as specified in the SMACNA Manual, with the following exceptions:

1. Rectangular ducts up to 42 inches wide, not having welded or soldered seams, and supported from overhead construction; extend strap hangers down over each side of the duct and turn under bottom of duct a minimum of two (2) inches. Secure hanger to duct with three (3) full thread sheet metal screws, one (1) in the bottom and two (2) in the side of the duct.

2. Rectangular ducts 43 inches wide and over, and all sizes of duct with welded or soldered seams, and supported from overhead construction; use trapeze hangers.

3. Prime coat plain steel rods threaded at the site immediately after installation with metal primer.

4. Dryer exhaust ductwork shall be supported at 48 inch intervals.

3.4 UPPER HANGER ATTACHMENTS

A. General

1. Secure upper hanger attachments to structural steel or steel bar joists wherever possible.

2. Do not use drive-on beam clamps, flat bars or bent rods, as upper hanger attachments.

3. Do not attach hangers to steel decks which are not to receive concrete fill.

4. Do not attach hangers to precast concrete planks less than 2-3/4 inches thick.

5. Avoid damage to reinforcing members in concrete construction.

6. Metallic fasteners installed with electrically operated or powder driven tools may be used as upper hanger attachments, in accordance with the SMACNA Manual, with the following exceptions:

   a. Do not use powder driven drive pins or expansion nails.
   b. Do not attach powder driven or welded studs to structural steel less than 3/16 inch thick.
   c. Do not support a load, in excess of 250 lbs from any single welded or powder driven stud.
   d. Do not use powder driven fasteners in precast concrete.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by ductwork support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five (5).

1. Secure upper hanger attachments to steel bar joists at panel points of joists.

2. Do not drill holes in main structural steel members.

C. Unless otherwise specified or shown on the drawings, support vertical rectangular ducts by means of two steel angles, secured to duct and resting on floor slab or adjacent structural steel member, at every other floor through which the duct passes. Size supports as follows:

MAX. SIDE DIMENSION (inches)	SUPPORT ANGLE (inches)	SECURE TO DUCT WITH	MIN BEARING AT EACH END (inches)
36	1 x 1 x 1/8	Screws	2
48	1-1/2 x 1-1/2 x 1/8	Bolts	3
60	2 x 2 x 1/8	Bolts	3
61 - up	2-1/2 x 2-1/2 x 3/16	Bolts	4

3.5 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state, and local requirements, referenced standards, and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Cleanliness

1. Before installing ductwork, wipe ductwork to a visibly clean condition.

2. During construction, provide temporary closures of metal or taped polyethylene on open ductwork and duct taps to prevent construction dust or contaminants from entering ductwork system. Seal ends of ductwork prior to installation to keep ductwork interior clean. Remove closures only for installation of the next duct section.

3. During duration of construction, maintain the integrity of all temporary closures until air systems are activated.

4. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

5. Slope duct toward grilles for moisture-laden ducts. Provide drain and trap at elbow of main moisture exhaust duct system.

D. Exposed Ductwork

1. Remove all markings, stickers, and labels.

2. Completely clean the exterior of all ducts prior to painting, duct is to be painted prior to project completion.

3. Any ductwork deemed in unsightly by the Architect/Engineer/Owner will be replaced at the Contractor's expense.

E. Hangers and Supports

1. All ductwork supports shall be in accordance with Table 4-1 (rectangular duct) and Table 4-2 (round duct) of the SMACNA Standards, with all supports directly anchored to the building structure.

2. Rectangular duct shall have at least one pair of supports on minimum 8'-0" (eight feet)

centers. All horizontal round and flat oval ducts shall have ducts hangers spaced 10'-0" (ten feet) maximum.

3. Lower attachment of hanger to duct shall be in accordance with Table 4-4 of the SMACNA Standards.

4. Vertical ducts shall be supported where they pass through the floor lines with 1-1/2 inch x 1-1/2 inch x 1/4 inch angles for duct widths up to 60 inches. Above 60 inches in width, the angles must be increased in strength and sized on an individual basis considering space requirements.

5. Hanger straps on duct widths 60 inches and under shall lap under the duct a minimum of 1 inch and have minimum of one fastening screw on the bottom and two on the sides.

6. Hanger straps on duct widths over 60 inches shall be bolted to duct reinforcing with 3/8 inch bolts minimum.

3.6 DUCTWORK SYSTEM CLEANING

A. If the system has been operated without schedule filters or if the integrity of temporary closures has been compromised, Contactor shall have ductwork cleaned according to National Air Duct Cleaners Association (NADCA) Standards by a Certified Regular Member of the NADCA.

B. For ductwork supplying Clean Rooms or patient care areas, also sanitize the ductwork interior per NADCA standards with a biocidal agent approved by the EPA for use in HVAC systems.

C. Before turning the installation over to the Owner, Contractor shall certify that the air handling systems have only been operated with scheduled filters in place. Otherwise, Contractor shall present evidence that the ductwork cleaned as required above.

3.7 TESTING

A. A minimum of 25% of all medium and high pressure duct systems (positive or negative) shall be pressure tested according to SMACNA test procedures (HVAC Air Duct Leakage Test Manual) and ASHRAE Standard 90.1 requirements. The ductwork to be tested shall be 25% of the lineal feet of ductwork mains starting at the air handling unit or fan.

1. Notify Owner minimum seven (7) calendar days in advance of leakage testing.

2. Design pressure for testing ductwork shall be determined from the maximum pressure generated by the fan at the nominal motor horsepower selected.

3. Total allowable leakage shall not exceed 1 percent of the total system design airflow rate.

4. When partial sections of the duct system are tested, the summation of the leakage for all sections shall not exceed the total allowable leakage.

5. Leaks identified during leakage testing shall be repaired by:

   a. Complete removal of the sealing materials.
   b. Thorough cleaning of the joint surfaces.
   c. Installation of multiple layers of sealing materials.

6. The ductwork system to be tested, shall exclude connections downstream of the terminal units (i.e., ductwork shall be capped immediately prior to the terminal units, and tested as described above).

7. After testing has proven that ductwork is installed and performs as specified, the terminal units shall be connected to ductwork and connections sealed with extra care. Contractor shall inform the Owner when joints may be visually inspected for voids, splits, or improper sealing of the joints. If any leakage exists in the terminal unit connections/joints after the systems have been put into service, leaks shall be repaired as specified for other leaks.

B. All low-pressure duct systems (positive or negative) shall be inspected for visible and audible signs of leakage.

C. Leaks identified by inspection shall be repaired by

1. Complete removal of the sealing materials.

2. Thorough cleaning of the joint surfaces.

3. Installation of multiple layers of sealing materials.

D. Discrepancies found during testing and balancing between duct traverses and diffuser/grille readings shall result in re-inspection, repair and retest until discrepancies are eliminated.

E. Ductwork leakage testing and/or inspection shall be performed prior to installation of external ductwork insulation.

END OF SECTION

SECTION 23 3300
DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the ductwork accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Airflow Control Dampers and Spin-In Fittings
2. Turning Vanes
3. Screens

1.2 REFERENCES

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. AMCA 500D – Laboratory Method of Testing Dampers for Rating
2. AMCA 500L – Laboratory Method of Testing Louvers for Rating
3. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
4. NFPA 101 - Life Safety Code
5. SMACNA - HVAC Duct Construction Standards
6. UL 33 - Heat Responsive Links for Fire-Protection Service
7. UL 555 – Standard for Fire Dampers
8. UL 555C – Standard for Ceiling Radiation Dampers
9. UL 555S – Standard for Smoke Dampers

1.3 SUBMITTALS

A. Product Data

1. Provide product data for shop fabricated assemblies including, but not limited to, volume control dampers, duct access doors, and duct test holes. Provide product data for hardware used.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 AIR FLOW CONTROL DAMPERS

A. Acceptable Manufacturers

1. Greenheck
2. Nailor Industries
3. Pottorff
4. Ruskin
5. Tamco
6. United Enertech
7. Louvers & Dampers, Inc.
8. NCA Manufacturing
9. Air Balance

B. Furnish and install dampers where shown on the Drawings and wherever necessary for complete control of airflow, including all supply, return, outside air, and exhaust branches, "division" in main supply, return and exhaust ducts, and each individual air supply outlet. Where access to dampers through a permanent suspended ceiling (gypsum board) is necessary, the Contractor shall be responsible for the proper location of the access doors.

C. Dampers larger than three (3) square feet in area shall be controlled by a self-locking splitter damper assembly.

D. Volume damper blades shall not exceed 48 inches in length or twelve inches in width and shall be of the opposed interlocking type. The blades shall be of not less than No. 16 gauge galvanized steel supported on one-half inch diameter rust-proofed axles. Axle bearings shall be the self-lubricating ferrule type.

E. Volume dampers and other manual dampers shall be carefully fitted, and shall be manually controlled by damper regulators as follows:

1. On exposed non-insulated ductwork the locking quadrant shall be made with a base plate of 16-gauge cold-rolled steel and a heavy die cast handle designed with a 3/8 inch bearing surface. A 1/4 inch-20 zinc plated wing nut shall firmly lock the handle in place.

2. On exposed externally insulated ductwork the regulator shall be 4-1/4 inch diameter, for 1/2 inch rod, designed for use on duct with insulation thickness specified for duct, and shall have four (4) 3/16 inch holes provided to rivet or screw regulator to the duct surface. The flange that covers the raw edge of the insulation shall be high enough so that it slightly compresses the insulation and holds insulation in place. The handle shall be 3/8 inch above the flange, and shall easily turn without roughing up the insulation.

3. On concealed ductwork above inaccessible ceilings, the regulator shall be 2-5/8 inch diameter chromium plated cover plate that telescopes into the base, for 1/2 inch rod. Regulator shall be cast into a box for mounting in ceilings. Base shall be 1-1/2 inch deep. The cover shall be secured by two (2) screws that can be easily removed for damper adjustment.

4. Furnish and install end bearings for the damper rods on the end opposite the quadrant.

F. Spin-in fittings may be used for duct taps to air devices and shall include dampers on all ducts to air devices (diffusers and grilles) even though a volume damper is specified for the air device. Spin-in fittings shall be similar to Flexmaster FLD with BO3 including a 2 inch build-out, nylon bushings, locking quadrant similar to Duro Dyne KR-3, and a 3/8 inch square rod connected to the damper with U-bolts. Spin-in fittings shall be sealed at the duct tap with sealant as specified herein. Determine location of spin-in fittings after terminal units are hung or after location of light fixtures are confirmed to minimize flexible duct lengths and sharp bends.

2.3 TURNING VANES

A. Acceptable Manufacturers

1. Ductmate Industries, Inc.

2. Duro Dyne Inc.

3. METALAIRE, Inc.

4. SEMCO Incorporated.

5. Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. Contractor fabricated turning vanes are acceptable provided they meet the requirements in this section.

E. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.4 SCREENS

A. Furnish and install screens on all duct, fan, etc., openings furnished by this Contractor which lead to, or are located outdoors.

B. Screens shall be No. 16 gauge, ½" mesh in removable frame as noted on drawings. Mesh and frame to be galvanized steel or aluminum as noted on the drawings.

C. Provide safety screens meeting OSHA requirements for protection of maintenance personnel on all fan inlets and fan outlets to which no ductwork is connected.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Volume Dampers

1. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

2. Install steel volume dampers in steel ducts.

3. Install aluminum volume dampers in aluminum ducts.

4. Set dampers to fully open position before testing, adjusting, and balancing.

5. Position damper adjacent to the branch connection to the main when possible. Locate as far as from the opening it serves in all other instances.

D. Test Holes

1. Install test holes at fan inlets and outlets and elsewhere as indicated.

2. Install duct test holes where required for testing and balancing purposes.

3. Install test holes in locations as required to measure pressure drops across each item in the system, e.g., outside air louvers, filters, fans, coils, intermediate points in duct runs, etc.

E. Balancing Dampers

1. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.

2. Provide all dampers furnished by the BAS Provider in strict accordance with manufacturer's written installation instruction and requirements of these Specifications.

F. General Installation

1. All installation shall be in accordance with manufacturer's published recommendations.

2. Furnish and install Ventlok No. 699 instrument test holes in the return air duct and in the discharge duct of each fan unit.

END OF SECTION

SECTION 23 3425
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the Power Ventilators indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section:

1. Centrifugal wall ventilators.

2. In-line centrifugal fans.

1.2 REFERENCES

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings

2. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings

3. AMCA 99 - Standards Handbook

4. ACMA 203 - Fan Application Manual - Field Performance Measurements

5. AMCA 204 - Balance Quality and Vibration Levels For Fans

6. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

7. AMCA 300 - Reverberant Room Method for Sound Testing of Fans

8. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data

9. NEMA MG1 - Motors and Generators

10. NFPA 70 - National Electrical Code

11. SMACNA - HVAC Duct Construction Standards - Metal and Flexible

12. UL 705 – Power Ventilators

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated

2. Certified fan sound-power ratings

3. Motor ratings and electrical characteristics, plus motor and electrical accessories

4. Material thickness and finishes, including color charts

5. Dampers, including housings, linkages, and operators

6. Roof curbs

7. Fan speed controllers

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof framing and support members relative to duct penetrations.

2. Ceiling suspension assembly members.

3. Size and location of initial access modules for acoustical tile.

4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for

intended use.

B. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal. The sound power levels must not exceed those indicated on Drawings.

D. Fabrication: Conform to AMCA 99.

E. Performance Base: 50 feet above sea level.

F. Fans shall be capable of operating stably at reduced loads imposed by means of variable speed drives.

G. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

H. UL Standard: Power ventilators shall comply with UL 705.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 CENTRIFUGAL WALL VENTILATORS

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. Acme

2. Twin City

3. Greenheck

4. Loren Cook Company

5. Pennbarry

6. Soler & Palau

7. Captiveaire

C. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.

D. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.

E. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.

F. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

3. Pulleys: Cast-iron, adjustable-pitch motor pulley.

4. Fan and motor isolated from exhaust airstream.

G. Accessories

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.

3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.

4. Wall Grille: Ring type for flush mounting.

5. Gravity Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.

6. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

H. Capacities and Characteristics

1. As scheduled on Drawings

2.2 IN-LINE CENTRIFUGAL FANS

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. Acme

2. Greenheck

3. Loren Cook Company

4. Pennbarry

5. Soler & Palau

6. Captiveaire

C. Description: In-line, direct-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

D. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

E. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

F. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

G. Accessories

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.

3. Companion Flanges: For inlet and outlet duct connections.

4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.

5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

H. Capacities and Characteristics

1. As scheduled on Drawings

2. Vibration Isolators:

3. As scheduled on Drawings

2.3 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and verify connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Adjust belt tension.

6. Adjust damper linkages for proper damper operation.

7. Verify lubrication for bearings and other moving parts.

8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.

10. Shut unit down and reconnect automatic temperature-control operators.

11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION

SECTION 23 3700
AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the air inlets and outlets indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section:

1. Grilles, Registers and Diffuser

2. Louvers

1.2 REFERENCES

A. Equipment and Installation shall meet the requirements outlined in the following references:

1. ACGIH: American Conference of Governmental Industrial Hygienists

2. AMCA: Air Movement and Control Association

3. NFPA: National Fire Protection Association

4. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.

5. UL: Underwriters Laboratories, Inc.

6. AMCA 500 – Test Method for Louvers, Dampers and Shutters

7. ANSI/NFPA 90A – Installation of Air Conditioning and Ventilating Systems

   ASHRAE 70 – Method of Testing for Rating the Air Flow Performance of Outlets and Inlets

1.3 SUBMITTALS

A. Product Data: (For Each Product)

1. Catalog cut-sheets

2. Indicate materials of construction, finish and mounting details

3. Mounting details

4. Installation instructions

5. Performance data (at actual operating conditions)
   a. Throw and drop
   b. Static-pressure drop

c. Noise ratings

6. Inlet and Outlet Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.4 QUALITY ASSURANCE

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Grilles, registers and diffusers shall be as scheduled on the Drawings. Grilles, registers and diffusers shall be provided with sponge rubber or soft felt gaskets where noted on the Drawings. Grilles, slot diffusers and laminar flow bars shall not be internally insulated.

C. If a manufacturer other than the one scheduled is used, the sizes shown on the Drawings shall be checked for performance, noise level, face velocity, throw, pressure drop, etc., before the submittal is made. Selections shall meet the manufacturer's own published data for the above performance criteria. The throw shall be such that the velocity at the end of the throw in the five (5) foot occupancy zone will not exceed 50 fpm or be less than 25 fpm except where indicated otherwise. Noise levels shall not exceed those published in ASHRAE for the type of space being served (NC level).

D. Locations of air distribution devices on Drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be influenced by the established general pattern of the lighting fixtures or architectural reflected ceiling plan, but primarily located to maintain proper air distribution. Where called for on Drawings, grilles, registers and diffusers shall be provided with deflecting devices and manual dampers. These grilles, registers, and diffusers shall be the standard product of the manufacturer, and subject to review by the Architect.

E. Provide a frame compatible with the type of ceiling or wall in which the devices are installed. Refer to Architectural Drawings for exact type of ceiling specified.

F. Coordinate color and finish of the devices with the Architect.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS, AND DIFFUSERS

A. Acceptable Manufacturers

1. Anemostat
2. Carnes
3. Krueger
4. Nailor
5. Price
6. Titus

7. Tuttle & Baily

B. Registers and Grilles – Return and Exhaust

1. Aluminum or Steel, as scheduled.

2. 1 1/4" wide borders to have a minimum thickness of 0.032” for sizes under 24” x 24”. Larger sizes shall be constructed of 0.040” or thicker material.

3. Screw holes to be used for mounting, shall be countersunk.

4. Blades shall be spaced on 3/4" centers.

5. Opposed blade damper with removable key operator, operable from face shall only be provided with registers or as noted on the Drawings.

C. Square Panel Face Diffuser – Supply and Return

1. Architectural diffuser with a square panel face, centered within a square housing. The exposed surface of the face panel shall be smooth, flat and free of visible fasteners.

2. The diffuser shall have a 22-gauge steel face panel that captures a secondary 22-gauge panel. The panel shall project a maximum of ¼” below the outside border of the diffuser.

3. For area of high moisture content or requiring non-ferrous materials, the diffuser shall be constructed of 22-gauge aluminum. This includes a 22-gauge aluminum panel that captures a secondary panel.

4. The face panel size shall be a minimum of 18” x 18” for 24” x 24” diffusers and 9” x 9” for 12” x 12” diffuers.

2.2 LOUVERS

A. Acceptable Manufacturers

1. American Warming and Ventilating

2. Anemostat

3. Arrow

4. Greenheck

5. Pottorff

6. Ruskin

7. Tamco

8. United Enertech

B. Performance

1. Pass 750 feet per minute free velocity with less than 0.10” of water pressure drop, based in accordance with AMCA 500

2. Water penetration less than 0.025 ounce of water per foot of free area at 900 feet per minute

3. Provide a minimum of 45% free area

C. Frame

1. Material: Extruded aluminum, Alloy 6063-T5

2. Wall Thickness: 0.081 inch, nominal

3. Depth: 6 inches

4. Furnish with exterior angle flange for installation

D. Blades

1. Depth: 6 inches

2. Style: Drainable

3. Material: Extruded aluminum, Alloy 6063-T5

4. Wall Thickness: 0.081 inch, nominal

5. Angle: 37.5 degrees

6. Centers: 6 inches, nominal

E. Bird Screen

1. Material (intake): Aluminum, 3/4” x 0.051”, expanded

2. Material (exhaust): Aluminum, 1/2" mesh x 0.063”

3. Frame: Removable, rewireable

F. Construction

1. All welded construction

2. Drain gutter in head frame and each blade

3. Downspouts in jambs to drain water from louver for minimum water to cascade from blade to blade

G. Accessories

1. Blank-off panels: 1”, aluminum skin, insulated core, factory installed with removable screws and neoprene gaskets.

2. Hinged frame: Continuous piano hinge attached to angle subframe

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

2. All installation shall be in accordance with manufacturer's published recommendations.

B. Diffusers

1. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, reflected ceiling plans, symmetry, and lighting arrangement.

2. Install air outlets and inlets to ductwork with airtight connection.

3. Provide balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

4. Provide all specialties and frames for air distribution devices as required for proper installation in ceiling type as indicated on Architectural Drawings. Provide all cutting and patching of T-bars, gypsum board, and other ceiling systems as required for installation of air devices.

C. Special Requirements

1. Paint ductwork visible behind air outlets and inlets matte black. Refer to Division 09.

END OF SECTION

SECTION 23 8126
SPLIT SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the split system air conditioning units indicated by the Contract Documents with supplementary items necessary for proper installation

B. Equipment Included in This Section

1. Split system air conditioner system with Variable Speed Inverter Compressor technology. The system shall consist of a horizontal discharge, single phase outdoor unit and a matched capacity indoor section that shall be equipped with a wired wall mounted and/or wireless handheld remote controller.

C. The indoor units shall be one (1) of the following configurations

1. Wall-mounted

a. 9,000 – 36,000 Btuh
b. Minimum 14.0 SEER

2. Ceiling-mounted recessed cassette

a. 12,000 – 42,000 Btuh
b. Minimum 13.6 SEER

1.2 REFERENCES

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1 (adopted version).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For computer-room air conditioners. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Color Samples: For unit cabinet, discharge grille, and exterior louver and for each color and texture specified.

D. Coordination Drawings: Plans, elevations, and other details, drawn to scale, using input from Installers of the items involved.

E. Field quality-control reports.

F. Operation and Maintenance Data: For computer-room air conditioners to include in emergency, operation, and maintenance manuals.

G. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.

C. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210 and bear the ARI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

1.5 WARRANTY

A. The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One (1) set of filters for each unit.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

1. Daikin

2. Fujitsu

3. LG

4. Mitsubishi Electric

5. Panasonic

6. Samsung

2.2 OUTDOOR UNITS - GENERAL

A. The outdoor unit shall be compatible with the four different types of indoor units as noted above. The connected indoor unit shall be of the same capacity as the outdoor unit.

B. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions.

C. Outdoor unit shall be capable of operating at 0° F ambient temperature without additional low ambient controls.

1. Optional wind baffle shall be required for operation down to -5˚ F ambient temperature.

D. The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between indoor and outdoor units.

E. The system shall have the following maximum tubing length restrictions between indoor and outdoor units. Line size changes, traps or additional oil will not be required using these parameters.

1. 9,000 – 18,000 Btuh: 100 feet

2. 24,000 – 42,000 Btuh: 165 feet

F. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

G. Outdoor unit sound level shall not exceed:

Capacity	Max dBA
12,000 / 18,000 Btuh	46
24,000 / 30,000 / 36,000 Btuh	48
42,000 Btuh	51

2.3 OUTDOOR UNITS – CONSTRUCTION

A. Cabinet

1. The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a Munsell 3Y 7.8/1.1 finish.

2. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.

3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.

4. The fan grill shall be of ABS plastic.

5. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

B. Fan

1. AC fan motor or DC fan motors are acceptable and will vary based on unit capacity.

2. The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated.

3. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts

C. Coil

1. The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard.

2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be control by a microprocessor controlled step motor.

D. Refrigerant Lines

1. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements.

2. Lines shall be individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes. Insulation to have a thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1” thick insulation shall have a - Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.

E. Compressor

1. The compressor for units with a capacity between 12,000 and 36,000 Btuh shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology.

2. The compressor for units with a capacity of 42,000 Btuh shall be a Frame Compliant Scroll compressor with Variable Speed Inverter Drive Technology.

3. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.

4. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.

5. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

F. Electrical

1. The electrical power of the unit shall be 208 volts or 230 volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.

2. Power for the indoor unit shall be supplied from the outdoor unit.

3. The outdoor unit shall be controlled by the microprocessor located in the indoor unit.

2.4 INDOOR UNITS – GENERAL

A. The indoor units shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor.

B. The unit, in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch.

C. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.

D. Fans

1. The indoor unit fan shall have multiple high performance, double inlet, forward curve fans driven by a single motor.

2. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of four (4) speeds: Low, M1, M2, and Hi plus AUTO fan setting. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and sensed space temperature.

E. Coil

1. The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing.

2. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow.

3. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory.

4. A condensate pan and drain shall be provided under the coil. An optional drain lift mechanism, capable of lifting condensate 23-5/8”(600mm) above the drain pan, shall be provided

F. Electrical

1. The electrical power of the unit shall be 208 volts or 230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.

2. The power to the indoor unit shall be supplied from the outdoor unit.

G. Control

1. The control system shall consist of a minimum of two (2) microprocessors, one (1) on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable.

2. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and controlling the outdoor unit. The control voltage from the wired controller to the indoor unit shall be 12/24 volts, DC. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Up to two wired controllers shall be able to be used to control one unit.

3. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.

2.5 INDOOR UNIT – WALL MOUNTED

A. The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter.

B. Cabinet color shall be white. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

2.6 INDOOR UNIT – CEILING MOUNTED RECESSED CASSETTE

A. The cabinet shall be formed from galvanized sheet metal coated with high-density foam insulation. Cabinet shall be for recessed mounting and provided with four (4) corner mounting supports behind removable corner pockets in Grille assembly allowing adjustment of mounting height from front of unit.

B. The cabinet panel shall have provisions for a field installed filtered outside air intake.

C. There shall be a knock-out to provide a branch air duct for conditioning a secondary space.

D. There shall be an optional multi-function casement which will mount between the unit cabinet and the Grille assembly to provide a second field installed filtered outside air intake and provide a mount for a high-efficiency filter element.

E. A separate grill assembly shall be attached to the front of the cabinet to provide supply air vanes in four directions and a center mounted return air section. The four-way grill shall be fixed to bottom of cabinet allowing two, three or four-way blow. The grill vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space. Grill assembly color shall be white.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, maintaining manufacturer's recommended clearances.

B. Air-Cooled Refrigerant Condenser Mounting: Install using elastomeric pads. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Drainage Connections: Comply with applicable requirements in Division 22 Section "Domestic Water Piping." Provide adequate connections for condensate drains.

D. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping." Provide shutoff valves and piping.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. After startup service and performance test change filters.

END OF SECTION

SECTION 23 8200
TERMINAL HEATING EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the following Terminal Heating Devices indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Electric Terminal Heat
   a. Cabinet Unit Heaters
   b. Unit Heaters

1.2 SUBMITTALS

A. Product Data: Catalog cuts, specifications, installation and maintenance instructions for each type of heater specified.

B. Schedule: List manufacturer, unit type, model number, and performance data for each unit heater.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Heaters shall be UL listed.

B. Certification: Affidavit from finned tube radiation manufacturer certifying that element has been tested in accordance with the requirements of IBR Testing and Rating Standard for finned tube radiation.

1.4 MAINTENANCE

A. Special Tools: One (1) tool for each type and size vandal resistant fastener.

PART 2 - PRODUCTS

2.1 CONFIGURATION AND PERFORMANCE

A. Refer to the equipment schedules for additional configuration and performance requirements.

2.2 ELECTRIC TERMINAL HEAT

A. Electric Cabinet Unit Heaters

1. Acceptable Manufacturers
   a. Berko

b. Indeeco
c. King Electric
d. Markel
e. Q-Mark
f. Raywall
g. Redd-I
h. Stelpro
i. Trane
j. TPI Corp

2. Unit Casing: Constructed of steel sheet formed, reinforced and braced for rigidity, with stamped grilles.

   a. Materials:
      1) Galvanized Steel Sheet: ASTM A 653, coating designation G90.
      2) Cold-Rolled Steel Sheet: ASTM A 366, cleaned, degreased and phosphatized.
   b. Factory Finish: Minimum two (2) coat baked enamel finish on exposed surfaces, color as directed.
   c. Insulation: Insulate interior surfaces of casing panels with 1/2 inch glass fiber meeting NFPA 90A requirements.
   d. Vertical Units: Minimum 18 gauge construction with removable front panel.
   e. Horizontal Units: Minimum 18 gauge construction with hinged bottom panel.

3. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550° F at any point during normal operation.

   a. Circuit Protection: One (1)-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
   b. Wiring Terminations: Stainless-steel or corrosion-resistant material.

4. Fan Assembly: Blow thru design.

   a. Fans: Forward curved centrifugal type, double width, statically and dynamically balanced, and directly connected to electric motor.

5. Motors: Three (3) speed, single phase electric motors of the permanent split capacitor or shaded pole type, with resilient mounting, built-in overload protection with automatic reset, and ball or sleeve bearings with accessible oilers, or permanently lubricated bearings.

6. Filter Section: Built-in filter frame mounted at air inlet with disposable air filters.

   a. Vertical Units: Filters removable without removing front panel for cabinet type units.
   b. Horizontal Units: Filters removed by pivoting hinged bottom panel.

7. Refer to schedule for cabinet style, control type and electrical requirements for the unit.

B. Electric Cabinet Unit Heaters

1. Acceptable Manufacturers

   a. Berko
   b. Brasch

c. Indeeco
d. King Electric
e. Markel
f. Q-Mark
g. Raywall
h. Redd-I
i. Stelpro
j. Trane
k. TPI Corp

2. Unit Casing: Constructed of steel sheet formed, reinforced and braced for rigidity, with stamped grilles.

   a. Materials:
      1) Galvanized Steel Sheet: ASTM A 653, coating designation G90.
      2) Cold-Rolled Steel Sheet: ASTM A 366, cleaned, degreased and phosphatized.
   b. Factory Finish: Minimum two (2) coat baked enamel finish on exposed surfaces, color as directed.
   c. Insulation: Insulate interior surfaces of casing panels with 1/2 inch glass fiber meeting NFPA 90A requirements.
   d. Vertical Units: Minimum 18 gauge construction with removable front panel.
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   a. Circuit Protection: One (1)-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
   b. Wiring Terminations: Stainless-steel or corrosion-resistant material.

4. Fan Assembly: Blow thru design.

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5. Motors: Three (3) speed, single phase electric motors of the permanent split capacitor or shaded pole type, with resilient mounting, built-in overload protection with automatic reset, and ball or sleeve bearings with accessible oilers, or permanently lubricated bearings.

6. Filter Section: Built-in filter frame mounted at air inlet with disposable air filters.

   a. Vertical Units: Filters removable without removing front panel for cabinet type units.
   b. Horizontal Units: Filters removed by pivoting hinged bottom panel.

7. Refer to schedule for cabinet style, control type and electrical requirements for the unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the Work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

END OF SECTION

SECTION 26 0500
COMMON WORK RESULTS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes basic electrical requirements, which are applicable to all Division 26, 27 and 28 sections.

B. Overview of Work

1. Power Distribution

2. Branch Power

3. Equipment Connections

4. Lighting and Lighting Controls

C. In these documents, “Contractor” refers to the Electrical Contractor and all their subcontractors, unless listed otherwise. The division of Work with the electrical scope is the responsibility of the lead Electrical Contractor.

D. The Contractor is responsible for providing and installing fully functional systems.

E. If the Work is shown on the drawings or noted in the specifications, it shall be included by the Contractor.

F. If equipment is provided by the Contractor, it shall be installed by the Contractor, unless noted otherwise.

G. Drawings are necessarily diagrammatic by their nature and are not intended to show every connection in detail or every conduit in its exact location. Carefully investigate structural and finish conditions and coordinate the separate trades in order to avoid interference between the various phases of Work. Organize and lay out Work so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Install all Work parallel or perpendicular to building lines unless otherwise noted.

H. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

I. All sizes as given are minimum except as noted.

J. All materials shall be new (unless noted or stated otherwise) and free of defect.

K. All work shall be subject to the Architect’s, Engineer’s, and Owner’s observations from the commencement of work until the acceptance of the completed work.

1.2 RELATED WORK

A. Applicable provisions of Division 0 and Division 1 govern work under this Section.

1.3 REFERENCES

A. All work shall conform to the most current version of all applicable codes and standards or the version adopted by the jurisdiction.

B. Codes

1. International Building Code

2. International Fire Protection Code

3. International Energy Conservation Code

4. NFPA – National Fire Protection Association

   a. NFPA 70 (National Electric Code)
   b. NFPA 72 (National Fire Alarm and Signaling Code)
   c. NFPA 101 (Life Safety Code)

5. State or City Codes for the State of Iowa.

C. Standards

1. ANSI

D. Governing Bodies

1. Owner's Insurance Company

2. State Fire Marshall

3. AHJ – Authority Having Jurisdiction

4. UL - Underwriters Laboratories

1.4 SUBMITTALS

A. The review of Shop Drawings by the Engineer is for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve the contractor from compliance with the requirements of the Plans and Specifications. Approval of a specific item shall not include approval of an assembly of which the item is a component. The Contractor is responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination with the Work of all trades; and for performing all work in a safe and satisfactory manner.

B. Refer to individual technical Specification sections for specific submittal requirements.

C. Submission of Shop Drawings electronically in .PDF format is required.

D. If hard copies of shop drawings are required for this project, coordinate the quantity with the Architect and General Contractor. Provide one (1) copy for the Engineer's records.

E. The Engineer will review one (1) resubmittal for each product. If additional resubmittals are required, the Contractor shall be responsible to bear the cost for the Engineer to recheck and handle the additional shop drawing submittals. Documents will not be reviewed until payment is agreed upon.

F. Contractor may request electronic files from the Engineer if needed to complete their Shop Drawings. An Electronic File Request Form will be sent to the contractor if files are requested and must be completed and signed before the AutoCAD files are released to the Contractor.

G. All submittals for equipment and materials shall be reviewed and approved by the Engineer prior to the fabrication or release by the contractor. This includes the coordination of equipment between trades. The release, purchase, installation or fabrication of any items prior to the contractor receiving an approved shop drawing will be at the contractor's own risk. Any rework that results will be provided by the contractor at no cost to the Owner or design team.

H. Submittals must be reviewed and approved by the Contractor before submitting to the Engineer.

I. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

1.5 ELECTRONIC DOCUMENT RELEASE

A. Electronic versions of the bid documents will be made available to the contractors for use during the bidding process and to help generate fabrication drawings for various systems. A summary of the requirements for the various document types is listed below:

1. PDF

    a. Contact the Construction Manager or Architect to obtain a PDF version of the Bid Documents. No Document Release Form is required.

2. REVIT

    a. The REVIT drawings will be converted to AutoCAD and then transferred to the contractor.
    b. Bluestone Engineering can provide an AutoCAD version of the bid documents for the contractor to use for generating shop drawings and fabrication drawings. This will include plan drawings with the architectural background. The contractor is responsible for incorporating any modifications that occur during bidding by all disciplines. Details and schedules will not be included.
    c. A document release form (see attached) will be required to be completed by the contractor to determine the version of AutoCad and drawings required.
    d. Submittal of the document release form fee will be required prior to the AutoCAD files being transmitted.

1.6 SUBSTITUTIONS

A. All manufacturers listed as Acceptable Manufacturers in each specification section are considered equal to the basis of design. The basis of design is preferred and will take precedence. Any products from an alternate approved manufacturer need to meet the requirements and performance specified and shall be equal to the basis of design.

B. The Contractor may request permission for a substitution of any item (equipment or material), subject to the following conditions:

1. Submit substitution requests in writing to the Engineer, on a form supplied by the Engineer. A sample copy of this form is included at the end of this section. An electronic copy can also be provided to the Contractor by the Engineer.

2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contractor documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed as well as any re-design costs incurred by the Architect or Engineer. The Contractor is also responsible for coordinating changes required by other trades.

3. Any requests for alternate manufacturers must be submitted to the Architect/Engineer at least ten (10) days prior to bid day. Incomplete substitution requests will not be considered.

C. Approval

1. No work involving requests for substitution shall commence without written approval on the provided form by the Engineer.

2. Any work started or material ordered/installed by the Contractor without written approval shall be removed/repaired at the sole expense of the contractor. The Contractor will also be responsible for any costs incurred by the Owner for such rework.

1.7 QUALITY ASSURANCE

A. Warranty

1. Equipment warranty shall be a minimum of one (1) year from date of factory supervised startup or from the date of substantial completion, whichever is later.

2. Contractor shall warranty all of their work for one (1) year from the date of substantial completion

B. These documents are diagrammatical in nature and intended to convey scope and general arrangement of the electrical and technology systems. Not all conduits, junction boxes, accessories, etc. are shown on Plan. If items are required to make a system fully operational but not shown on Plan or in these Specifications, they shall be included by the Contractor.

C. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Architect and Engineer for interpretations.

D. It is the contractor’s responsibility to determine all utility routing prior to purchase and installation of material.

E. Install all equipment per the manufacturer’s requirements / recommendations.

F. No equipment provided or installed shall contain mercury.

G. All equipment shall be UL listed where applicable.

1.8 REGULATORY AND UTILITY REQUIREMENTS

A. Contractor is responsible for coordinating all required site inspections by authorities having jurisdiction. Contractor shall notify General Contractor of all scheduled inspections seven (7) working days prior to site visit.

B. Contractor is responsible for paying for all fees, permits, and inspections that are required to complete their work.

C. Contractor shall include all work required to install new utilities and meters as shown on drawings.

1.9 PROTECTION OF FINISHED SURFACES

A. Furnish one (1) can of touch-up paint for each different color factory finish for equipment furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.10 OMISSIONS

A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect and Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.11 DELIVERY, STORAGE, AND HANDLING

A. During installation, equipment shall be protected against entry of foreign matter; and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.

B. Take such precautions as are necessary to protect apparatus and materials from damage. Damaged equipment shall be, as determined by the Owner and/or Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.

C. Protect factory finish from damage during construction operations until acceptance of the Project. Restore any finishes that become stained or damaged to Owner’s satisfaction.

1.12 DIVISION OF WORK AND COORDINATION

A. The Electrical Contractor is responsible for providing and installing power wiring up to equipment provided by others for a single point connection. Internal wiring of equipment provided by others shall be the responsibility of the manufacturer or the contractor responsible for providing and installing the equipment.

B. Controls, disconnect switches, starters, variable frequency drives, etc. shall be provided and installed by the contractor noted on the plans and in the specifications. It is the responsibility of the Contractor to request written clarification for any ambiguity regarding division of work and coordination at least ten (10) days prior to bid.

C. Arrange for conduit and raceway spaces, chases, slots, and openings in building structure during progress of construction, to allow for electrical installations.

D. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

E. Coordinate requirements for access panels and doors for electrical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

1.13 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation as applicable:

1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.

2. A control sequence describing start-up, operation, and shutdown.

3. Description of the function of each principal item of equipment.

4. Installation instructions.

5. Safety precautions for operation and maintenance.

6. Diagrams and illustrations.

7. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers and replacement frequencies.

8. Performance data.

9. Where applicable, pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.

10. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

1.14 RECORD DRAWINGS

A. The Contractor shall maintain at least one (1) copy of the Specifications and Drawings on the job site at all times.

B. The Architect will provide the Contractor with a suitable set of Contract Drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.

C. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.

D. At completion of the project, the Contractor shall submit the marked-up record drawings to the Owner prior to final payment.

PART 2 - PRODUCTS

2.1 GENERAL

A. Conditions: Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type of product specified.

B. Common Source: Equipment specified in Sections 262416 Panelboards, 262728 Disconnect Switches shall be provided by the same manufacturer.

2.2 ACCESS PANELS AND DOORS

A. Provide access panels and/or doors where required to maintain access to the electrical installation and where noted on the Drawings.

2.3 IDENTIFICATION

A. See Electrical Section 260553 – Identification.

2.4 SEALING AND FIRESTOPPING

A. Non-Rated Penetrations

1. Conduit Penetrations Through Below Grade Walls

a. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated conduit and the cored opening or a water-stop type wall sleeve.

2. Conduit and Cable Tray Penetrations

a. At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with Division 31.

3.2 CONCRETE WORK

A. The Division 3 Contractor will perform all cast-in-place concrete unless noted otherwise elsewhere. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

3.3 CUTTING AND PATCHING

A. Refer to Division 1, General Requirements, Cutting and Patching.

3.4 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this Contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.5 EQUIPMENT ACCESS

A. Install all conduit, raceways, and accessories to permit access to equipment for maintenance.

3.6 COORDINATION

A. The Contractor shall cooperate with other trades in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.

C. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing Contractor's expense.

D. Coordinate clearances in front of and above electrical distribution equipment with other trades to avoid interference issues. Maintain clearances as defined in the National Electrical Code. Pipes, ducts, etc. shall not be installed above electrical distribution equipment.

3.7 SLEEVES

A. Pipe sleeves for conduits 6" in diameter and smaller, in new poured concrete construction, shall be schedule 40 steel pipe, plastic removable sleeve or sheet metal sleeve, all cast in place.

B. In wet area floor penetrations, top of sleeve to be 2 inches above the adjacent floor.

3.8 SEALING AND FIRESTOPPING

A. Non-Rated Surfaces

1. When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approved type of material.

2. Install escutcheons or floor/ceiling plates where conduit penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.

3. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the conduit and tighten in place, in accordance with the manufacturer's instructions. Install so that the bolts used to tighten the seal are accessible from the interior of the building or vault.

4. At interior partitions, conduit penetrations are required to be sealed for all clean rooms, laboratories, and most hospital spaces, computer rooms, dormitory rooms, telephone/data/com rooms and similar spaces where the room pressure or odor transmission must be controlled. Apply sealant to both sides of the penetration in such a manner that the annular space between the conduit sleeve and the conduit is completely filled.

3.9 HOUSEKEEPING AND CLEAN UP

A. The Contractor shall clean up and remove from the premises, daily, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.10 TESTING

A. Test Conditions

1. Place circuits and equipment into service under normal conditions, collectively and separately, as may be necessary to determine satisfactory operation. Perform specified tests in the presence of the Owner's representative(s). Furnish all instruments, wiring, equipment and personnel required for conducting tests. Demonstrate that the equipment operates in accordance with requirements of the Contract Documents. Special tests on certain items are specified hereinafter.

B. Circuit Verification: All 120-volt single-phase circuits shall be verified to match the Drawings and panel schedules by “ringing out" each circuit in the presence of the Owner’s representative(s).

3.11 OWNER TRAINING

A. All training provided for the Owner shall comply with the format, general content requirements and submission guidelines specified under Section 019101, or 019102.

3.12 NFPA 70E COMPLIANCE

A. The Electrical Contractor will be responsible for providing ARC Flash labeling for all electrical

distribution equipment installed or modified as part of this contract. This includes but is not limited to: Identification of ARC Flash Boundaries, Application of Proper labels, and Identification of Proper Labels, and Identification of Proper Personal Protective Equipment.

B. The Contractor must ensure that personnel working on the equipment while energized are qualified to do so and are wearing the appropriate ARC Flash personal protective equipment. Documentation of this training is required.

E. The Electrical Contractor will include in his bid the cost to hire a qualified Engineer to perform the necessary ARC Flash study.

3.13 PROJECT CLOSEOUT REQUIREMENTS

A. Final project closeout tasks

1. All equipment labeled per specifications.

2. All equipment cleaned and ready for use.

B. Contractor requirements

1. Marked up drawings and specifications provided to Engineer for incorporation of as-built drawings or to serve as the as-built drawings depending on the project requirements. As-built drawings shall be clean and legible.

2. Operation and Maintenance (O & M) Manuals shall include the following:

   a. Contractor contact for warranty work
   b. Approved shop drawings, incorporating all review comments
   c. Warranty copies
   d. Equipment start-up reports
   e. Operation and maintenance instructions

3. Utility Rebate Forms

   a. Contractor shall submit completed energy rebate forms for each piece of equipment that is eligible for a rebate. Eligible equipment shall include, but not be limited to the following:
      1) Interior Lighting
      2) Exterior Lighting
      3) Occupancy Sensors
   b. Contractor to complete information regarding equipment. Submit form to Owner; Owner will complete Owner's contact information and send the completed form to the utility.

C. Three (3) final approved O & M Manuals shall be delivered to Owner. Each manual shall be an appropriately sized three (3) ring binder with a vinyl cover and printed spine and cover labels. Each section shall have a printed divider tab. Each section shall be listed in a table of contents at the beginning of the manual.

END OF SECTION

(ELECTRONIC DOCUMENT RELEASE FORM & SUBSTITUTION REQUEST FORMS ATTACHED)

Document Release Form

Information Requested:

Project Name:
Drawings Requested:

Media Type: (Check all that are applicable)

- ☐ AutoCAD DWG Files (Version _____)
- ☐ REVIT Files (Version _____)
- ☐ Adobe PDF Files
- ☐ Other

Requesting Party:

Name:

Company:

Signature:

Date:

Address 1:

Address 2:

Email Address:

Phone #:

Bluestone Use:

Form Sent By:

Date:

Bluestone Project #:

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or sub consultants that may arise out of or in connection with your use of the electronic files. Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files. These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project. Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display.

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SUBSTITUTION REQUEST FORM (DURING BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution: _____

MANUFACTURER	TRADE NAME	MODEL NO.
_____	_____	_____

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

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

The Undersigned certifies:

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

Submitted by:

_____
Signature

_____
Firm

_____
Telephone Email Date

Engineer's Review and Action

☐ Substitution Approved
☐ Substitution Approved As Noted
☐ Substitution Rejected
☐ Substitution Request Received Too Late

Signed by:

_____
Date

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

SUBSTITUTION REQUEST FORM (AFTER BIDDING)

We submit for your consideration the following product instead of the specified item for the following project:

PROJECT: _____

SPEC. SECTION	SPEC. TITLE	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution: _____

MANUFACTURER	TRADE NAME	MODEL NO.
_____	_____	_____

INSTALLER	PHONE NO.
_____	_____

History: ☐ New Product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days

Savings to Owner for accepting substitution: $_____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by:

_____
Signature

_____
Firm

_____
Telephone Email Date

Engineer's Review and Action

☐ Substitution Approved
☐ Substitution Approved As Noted
☐ Substitution Rejected
☐ Substitution Request Received Too Late

Signed by:

_____
Date

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required for furnishing and installing required wiring and cabling systems including pulling, terminating and splicing.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section

B. Section 260533 Raceway and Boxes

C. Section 260553 Identification

1.3 SUBMITTALS

A. Submit product data: Provide for each cable assembly type.

1.4 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper.

C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.1 GENERAL

A. All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.

B. All conductors shall be copper.

C. Aluminum conductors size #1/0 and larger may be substituted for copper. Aluminum conductors may be substituted for copper feeders in sizes 50 amps and larger. The following requirements shall be met when aluminum conductors are used:

1. Aluminum alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 series alloy).

2. Aluminum alloy conductors must meet or exceed all ASTM specifications, UL Standard 83 and UL Standard 1063 and all requirements as specified in National Electrical Code Article 310.

3. It is the responsibility of the contractor to increase the size of the conduit, wire gutter, or enclosure, if necessary, to accommodate the aluminum conductors and meet allowable code requirements.

4. It is the responsibility of the contractor to increase the size of the aluminum conductor to match the ampacity of the copper conductor circuit shown on the Drawings.

5. All aluminum conductors shall terminate on a mechanical screw-type connector or mechanical compression-type connector. Connector shall be dual rated (ALCU, AL7CU or AL9CU) and Listed by UL for use with aluminum and copper conductors, and sized to accept aluminum conductors of the required ampacity.

6. When using compression-type connectors, the lugs shall be marked with wire size, die index, number and location of crimps and shall be suitably color-coded.

7. Using a suitable stripping tool, remove insulation from the required length of the conductor. Use caution to avoid damage to any of the individual strands.

8. Wire brush the conductor to remove any insulation that may have become trapped between the strands and apply a Listed joint compound.

9. Tighten or crimp the connection per the connector manufacturer's recommendation.

10. Wipe off any excess joint compound.

11. When terminating aluminum conductors to aluminum bus, prepare a mechanical screw-type or compression-type connection. Bolts shall be anodized alloy and conform to current ANSI and ASTM chemical and mechanical property limits. Nuts shall be aluminum alloy and conform to current ANSI standards. Washers shall be flat aluminum alloy, Type A plain, standard wide series conforming to current ANSI standards. Lubricate and tighten the hardware per manufacturer's recommendations.

12. When terminating aluminum conductors to copper bus, prepare a mechanical screw-type or compression-type connection. Bolts shall be plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to current ASTM standard or SAE grade 5. Nuts shall conform to current ANSI standards. Washers shall be steel, Type A plain, standard wide series conforming to current ANSI standards. Belleville conical spring washers shall be of hardened steel, cadmium plated or silicone bronze. Lubricate and tighten the hardware per manufacturer's recommendations.

13. The contractor shall perform an infrared survey of all aluminum conductor connections after the installation is complete and in normal service. Infrared surveys shall be performed during periods of maximum possible loading with at least 30% of rated load of the equipment being inspected. All connections with elevated temperatures shall be corrected by the contractor. The infrared survey results shall be provided in report form, in the completed O&M manuals.

D. Insulation shall have a 600 volt rating.

E. All conductors shall be stranded.

F. Stranded conductors may only be terminated with UL OR ETL Listed type terminations or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device or must be terminated in an approved back wired method.

2.2 BUILDING WIRE

A. Acceptable Manufacturers: American Insulated Wire Corp., BICC General Cable Industries Inc., Cerro Wire & Cable Co. Inc., Pirelli Cable Corp., Rome Cable Corp., or Southwire Co.

B. Single Conductor Insulated Wire.

1. THHN, THW, THW-2, THWN, THWN-2, XHH, XHHW, or XHHW-2: Wiring in dry or damp locations (except where special type insulation is required).
2. THWN, THWN-2, XHHW, XHHW-2: Wiring in wet locations or special type insulation is required).
3. THHN, THW-2, THWN-2, XHHW, or XHHW-2: Wiring for electric discharge lighting circuits (fluorescent, HID), except where fixture listing requires wiring rated higher than 90° C.

2.3 WIRING CONNECTORS

A. Split Bolt Connectors: Not acceptable unless noted otherwise.

B. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads or terminals. Not approved for splicing.

C. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.

D. All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.

E. Mechanical Connectors:

1. Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.

F. Insulated Connector Blocks:

1. Conductor count, size, and entry configuration to match application.
2. UV rated.
3. Dual rated for use with copper or aluminum conductors.
4. 600 volt, 90° C termination rating.
5. Caps for sealing wrench access port.

G. Compression (crimp) Connectors:

1. Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps.

2.4 WIRE MANAGEMENT

A. Cable Clamps and Clips, Cable Ties, Spiral Wraps, etc: Catamount/T&B Corp., or Ideal Industries Inc.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

A. Install electrical cable, wire and connectors as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, and as required to ensure that products serve the intended functions.

B. Cables shall be selected on the basis of their purpose and UL listing.

1. Generally, use Types THWN, XHHW and THNN in building interiors and other dry locations.

2. Outdoors and in underground raceways, use Type THWN or other conductor type rated for wet location as required by NEC 300.5(B).

3. Conductors subject to abrasion, such as in lighting poles, shall be Type THWN or THHN.

C. All wire and cable shall be installed in conduit.

D. Do not use wire smaller than 12 AWG for power and lighting circuits. Minimum size for control circuits shall be 14 AWG copper stranded.

E. All conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity.

F. As a minimum use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 100 feet.

G. Make conductor lengths for parallel conductors equal.

H. Splice only in junction or outlet boxes.

I. No conductor less than 10 AWG shall be installed in exterior underground conduit.

3.2 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use Listed wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor) in the same raceway. If parallel phase and/or neutral wires are used, then place an equal number of phase and neutral conductors in same raceway or cable.

3.3 WIRING CONNECTIONS AND TERMINATIONS

A. Splice only in accessible junction boxes.

B. Wire splices and taps shall be made firm, and adequate to carry the full current rating of the respective wire without soldering and without perceptible temperature rise.

C. All splices shall be so made that they have an electrical resistance not in excess of two feet (600 mm) of the conductor.

D. Use solderless spring type pressure connectors with insulating covers for wire splices and taps, 10 AWG and smaller.

E. Use mechanical or compression connectors for wire splices and taps, 8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.

F. Thoroughly clean wires before installing lugs and connectors.

G. At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

H. Protect wiring in device and junction boxes from paint overspray. Wiring covered with paint shall be removed and replaced where needed by the Contractor.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 260504 Cleaning and Testing.

3.5 WIRE COLOR

A. For wire sizes 10 AWG and smaller - Wire shall be colored as indicated below.

B. For wire sizes 8 AWG and larger – Use colored wire, or identify wire with colored ½" or ¾" tape bands at all terminals, splices and boxes. Tape bands shall be installed at every 12" for the entire visible length. Colors to be as indicated below.

C. Use the following color scheme:

1. Phase A black, Phase B red and Phase C blue for circuits at 120/208 volts single or three phase.

2. Neutral Conductors: White for 120/208V and 120/240V systems, Gray for 277/480V systems. Where there are two or more neutrals in one conduit, each shall be individually identified with a different stripe.

D. All switch legs shall be the same color as their associated circuit. Traveler conductors run between 3 and 4 way switches shall be colored pink or purple.

E. Ground Conductors: Green for 2 AWG and smaller. For 1 AWG and larger, identify with green colored wire, or with green tape at both ends and at all access points, such as panelboards, motor starters, disconnects and junction boxes. When isolated grounds are required, contractor shall provide green with yellow tracer.

3.6 WIRE MANAGEMENT

A. Use wire management products to bundle, route, and support wiring in junction boxes, pullboxes, wireways, gutters, channels, and other locations where wiring is accessible.

3.7 BRANCH CIRCUITS

A. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All branch circuits shall be furnished and installed with an individual accompanying neutral, sized the same as the phase conductors.

END OF SECTION

SECTION 26 0526
GROUNDING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following grounding indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section

1. Grounding electrodes and conductors

2. Equipment grounding conductors

3. Bonding.

1.2 REFERENCES

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All design, materials, installation and testing pertaining to grounding and bonding system shall comply with the latest edition of applicable requirements and standards addressed within the following references:

1. Applicable provisions of Division 1 govern work under this Section

2. Section 260519 – Low Voltage Electrical Power Conductors and Cable

3. NFPA 70 - National Electrical Code.

4. ANSI/IEEE 142 (Latest edition) - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

5. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System.

6. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment (IEEE Emerald Book).

7. IEEE C2 - National Electrical Safety Code (NESC).

8. UL 467 – Grounding and Bonding Equipment.

9. UL 497 - Protectors for Paired-Conductor Communications Circuits.

10. UL 497A - Secondary Protectors for Communications Circuits.

11. UL 497B - Protectors for Data Communications and Fire-Alarm Circuits

12. UL 1449 - Standard for Safety Surge Protective Devices

13. BICSI Telecommunications Distribution Methods Manual (TDMM), Latest Edition.

14. ANSI J-STD-607-A – Commercial Building Grounding and Bonding Requirements for Telecommunications.

1.3 SUBMITTALS

A. Product Data: Provide data for grounding electrodes and connections.

B. Manufacturer's Instructions: Include instructions for preparation, installation and examination of exothermic connectors.

1.4 QUALITY ASSURANCE

A. See Part 3 of this Specification for system requirements and performance requirements.

1.5 SUMMARY

A. Ground the electrical service system neutral at service entrance equipment to grounding electrode system. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operations. Provide a completely grounded system in accordance with Article 250 of the NEC

B. Metal water piping system(s) installed in or attached to a building or structure shall be bonded to the service equipment enclosure, the grounded conductor at the service. Where installed in or attached to a building or structure, a metal piping system(s), including gas piping, that is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service. The bonding jumper(s) shall be sized in accordance with Article 250 of the NEC.

C. Concrete reinforcing bars shall be permitted for grounding. Connect the structural metal frame to the reinforcing bars of concrete-encased electrode. Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system where the steel reinforcing bars or rods are not accessible for use without disturbing the concrete.

D. Bond together system service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, metal cable trays, auxiliary gutters, meter fittings, boxes, cable armor, cable sheath, ground bus in electrical rooms, metal frame of the building or structure, grounding conductor in raceways and cables, receptacle ground connectors, and metallic plumbing systems.

1.6 CERTIFICATIONS

A. Two (2) weeks prior to final inspection, submit four (4) copies of the following to the Engineer and General Contractor/Construction Manager:

1. Certification that the materials and installation is in accordance with the drawings and specifications.

2. Certification, by the Contractor, that the complete installation has been properly installed and tested.

1.7 CLOSEOUT SUBMITTAL AND PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of grounding electrodes. Include the location of system grounding electrode connections and the routing of aboveground and underground grounding electrode conductors.

B. Test Reports: Indicate overall resistance to ground and resistance of each electrode

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Grounding system components shall be as required to comply with the design and construction of the system indicated. Components shall be as indicated in manufacturer's submittal data.

2.2 ROD ELECTRODE

A. Material: Copper-clad steel.

B. Diameter: 3/4 inch minimum.

C. Length: Ten (10) feet minimum.

2.3 PLATE ELECTRODE

A. Copper plates minimum 0.06 inches thick by 2'-0" square feet of surface area.

2.4 MECHANICAL CONNECTORS

A. Products:

1. Ground Clamps (Cable to Pipe):
    a. Blackburn/T&B Corp.'s GUV
    b. Framatome Connectors/Burndy Corp.'s GAR, GD, GP, GK
    c. OZ/Gedney Co.'s ABG, CG
2. Ground Clamps (Cable to Rod):
    a. Blackburn/T&B Corp.'s GG, GGH, JAB, JABH, GUV
    b. Dossert Corp.'s GN, GPC
    c. Framatome Connectors/Burndy Corp.'s GP, GX, GRC
    d. OZ/Gedney Co.'s ABG
3. Ground Lugs - Copper, one (1) or two (2) hole style (to suit conditions), long barrel:
    a. Anderson/Hubbell's VERSAtile VHCL
    b. Blackburn/T&B Corp.'s Color-Coded CTL, LCN

c. Framatome Connectors/Burndy's Hylug YA
d. Electrical Products Div./3M Scotchlok 31036 or 31145 Series
e. Ideal Industries Inc.'s CCB or CCBL
f. Thomas & Betts Corp.'s 54930BE or 54850BE Series

B. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lockwashers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.

C. Split bolt connector types are NOT allowed. Exception: the use of split bolts is acceptable for grounding of wire-basket type cable tray, and for cable shields/straps of medium voltage cable.

D. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.5 COMPRESSION CONNECTORS

A. The compression connectors shall be manufactured from pure wrought copper.

B. The conductivity of this material shall be no less than 99% by IACS standards.

C. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

D. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.

E. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.

F. Each connector shall be factory filled with an oxide-inhibiting compound.

2.6 EXOTHERMIC CONNECTIONS

A. As manufactured by Erico (Cadweld), T&B (Furseweld) or similar.

2.7 GROUND CONDUCTORS

A. Material:

1. Provide 600-volt insulated copper (aluminum not permitted) conductors having a green-colored insulation for grounding electrode and equipment grounding conductors. Use stranded conductors.

2. Conduit grounding conductors shall be insulated copper conductor, green in color to size 2 AWG. Insulated conductors larger than 2 AWG shall be same as phase conductors but identified with green or green/yellow tape at each accessible opening or location in raceway.

3. Provide bare conductors for bonding jumpers.

4. Provide tinned copper conductors for exterior installations.

5. Communications cable tray grounding conductors shall be a minimum of 6 AWG bare copper conductor.

B. Grounding Electrode Conductor: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger.

C. Foundation Electrodes: As shown on drawings or details.

D. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used on the same facility.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 GENERAL

A. Install Products in accordance with manufacturer's instructions.

B. Install grounding conductors continuous, without splice or connection, between equipment and grounding electrodes.

C. Size: When grounding and bonding conductors are not sized on Drawings, size the grounding conductors in accordance with NEC. Size bonding jumper so that minimum cross-sectional area is greater than or equal to that of the equivalent grounding conductor as determined from NEC.

D. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.

E. Ground connection surfaces shall be cleaned and all buried or inaccessible connections shall be made so that it is impossible to move them.

F. Attach grounds permanently before permanent building service is energized.

G. All grounding electrode conductors shall be installed in PVC conduit, in exposed locations.

3.3 LESS THAN 600 VOLT SYSTEM GROUNDING

A. System Grounding:

1. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.

B. Metallic Piping, Building Steel, and Supplemental Electrode(s)

1. Provide a grounding electrode conductor sized per NEC between the service equipment ground bus and all metallic water and gas pipe systems, building steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.

C. Provide a supplemental ground electrode and bond to the grounding electrode system. Use driven ground rod(s) on exterior of building.

D. Service Disconnect (Separate Individual Enclosure): Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors

E. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

F. Conduit System:

1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.

2. Non-metallic conduit systems shall contain an equipment grounding conductor, except that non-metallic feeder conduits which carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment need not contain an equipment grounding conductor.

3. Install an insulated grounding conductor internally to all flexible metal conduits. All flexible metal conduit containing power circuits shall utilize grounding bushings. The grounding bushing shall contain a bonding jumper and shall be terminated at the equipment ground bus. The grounding conductor shall terminate at the equipment ground bus. Install external ground wire on liquid tight flexible metal conduit. Provide suitable grounding bushing at each end of liquid tight flexible metal conduit at transformers. External ground wire shall be in addition to grounding conductors installed internal to raceway system.

4. Conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.

G. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders and power and lighting branch circuits.

H. Boxes, Cabinets, Enclosures, and Panelboards:

1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.

2. Provide lugs in each box and enclosure for equipment grounding conductor termination.

3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.

I. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.

J. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.

K. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.4 CONDUCTIVE PIPING

A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.5 CORROSION INHIBITORS

A. When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

3.6 GROUND ROD INSTALLATION

A. Drive each rod vertically in the earth, not less than 10 feet in depth.

B. Where permanently concealed ground connections are required, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with mechanical pressure type ground connectors.

C. Where rock prevents the driving of vertical ground rods, install angled ground rods or grounding electrodes in horizontal trenches to achieve the specified resistance.

3.7 GROUND RESISTANCE

A. Grounding system resistance to ground shall not exceed 5 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the Owner. Final tests shall assure that this requirement is met.

B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

C. Services at power company interface points shall comply with the power company ground resistance requirements.

D. Engineer has the option to observe below-grade connections prior to backfilling. The Contractor shall notify the Engineer 24 hours before the connections are ready for observation.

3.8 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

END OF SECTION

SECTION 26 0529
HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following hangers and supports indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section

1. Conduit and equipment supports
2. Straps
3. Clamps
4. Steel channel, etc.
5. Fastening hardware for supporting electrical work.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

A. Shop Drawings: Show support details if different from methods specified or shown on the drawings.

B. Product Data: Catalog sheets, specifications and installation instructions.

1.4 QUALITY ASSURANCE

A. Support systems shall be adequate for the weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 ANCHORING DEVICES

A. Sleeve Anchors

1. Molly/Emhart’s Parasleeve Series
2. Phillips’ Red Head Dynabolt Series
3. Ramset’s Dynabolt Series

B. Wedge Anchors

1. Hilti's Kwik Bolt Series
2. Molly/Emhart's Parabolt Series
3. Phillips' Red Head Trubolt
4. Ramset's Trubolt Series

C. Concrete Screw Anchors

1. Phillips' Red Head Tapcon

D. Non-Drilling Anchors

1. Hilti's Drop-In Anchor Series
2. Phillips' Red Head Multi-Set II Series
3. Ramset's Dynaset Series

E. Stud Anchors

1. Phillips' Red Head JS Series

2.2 CAST-IN-PLACE CONCRETE INSERTS

A. Continuous Slotted Type Concrete Insert, Galvanized:

1. Load Rating 1300 lbs./ft.: Kindorf's D-986
2. Load Rating 2400 lbs./ft.: Kindorf's D-980
3. Load Rating 3000 lbs./ft.: Hohmann & Barnard Inc.'s Type CS-H
4. Load Rating 4500 lbs./ft.: Hohmann & Barnard Inc.'s Type CS-HD

B. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded.

C. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, designed to accept bolts having special wedge shaped heads.

2.3 HAMMER SET ANCHOR

A. Zinc plated steel drive pin with expanding alloy body:

1. Phillips' Red Head HS Series
2. Hilti HIT Series
3. Ramset Shuredrive Series

2.4 MISCELLANEOUS FASTENERS

A. Except where shown otherwise on the Drawings, furnish fastener type, size, and grade required for proper installation of the Work. Select from the following:

1. Cadmium or Zinc Coated Fasteners: Dry locations.

2. Galvanized Fasteners: For exterior use, or for items anchored to exterior walls, except where stainless steel is indicated.

3. Stainless Steel Fasteners: Type 302 for interior Work; Type 316 for exterior Work; Phillips head screws and bolts for exposed Work unless otherwise specified.

2.5 HANGER RODS

A. Mild low carbon steel, unless otherwise specified; fully threaded or threaded each end, with nuts as required to position and lock rod in place. Unless galvanized or cadmium plated, provide a shop coat of red lead or zinc chromate primer paint.

B. Minimum sized threaded rod for supports shall be 3/8” for trapezes and single conduits 1-1/4” and larger, and 1/4” for single conduits 1” and smaller.

2.6 “C” BEAM CLAMPS

A. With Conduit Hangers

1. For 1 Inch Conduit Maximum:

   a. B-Line Systems Inc.’s BG-8, BP-8 Series
   b. Caddy/Erico Products Inc.’s BC-8P and BC-8PSM Series
   c. GB Electrical Inc.’s HIT 110-412 Series

2. For 3 Inch Conduit Maximum:

   a. Appleton Electric Co.’s BH-500 Series beam clamp with H50W/B Series hangers
   b. Kindorf’s 500 Series beam clamp with 6HO-B Series hanger
   c. OZ/Gedney Co.’s IS-500 Series beam clamp with H-OWB Series hanger

3. For 4 Inch Conduit Maximum:

   a. Kindorf’s E-231 beam clamp and E-234 anchor clip and C-149 series lay-in hanger
   b. Unistrut Corp.’s P2676 beam clamp and P-1659A Series anchor clip with J1205 Series lay in hanger

B. For Hanger Rods

1. For 1/4 Inch Hanger Rods:

   a. B-Line Systems Inc.’s BC
   b. Caddy/Erico Products Inc.’s BC
   c. GB Electrical Inc.’s HIT 110
   d. Kindorf’s 500, 510
   e. Unistrut Corp.’s P1648S, P2398S, P2675, P2676

2. For 3/8 Inch Hanger Rods:

   a. Caddy/Erico Products Inc.’s BC

b. Kindorf's 231-3/8, 502
c. Unistrut Corp.'s P1649AS, P2401S, P2675, P2676

3. For 1/2 Inch Rods:

a. Appleton Electric Co. BH-500 Series
b. Kindorf's 500 Series, 231-1/2
c. OZ/Gedney Co.'s IS-500 Series
d. Unistrut Corp.'s P1650AS, P2403S, P2676

4. For 5/8 Inch Rods: Unistrut Corp.'s P1651AS beam clamp and P1656A Series anchor clip.

5. For 3/4 Inch Rods: Unistrut Corp.'s P1653S beam clamp and P1656A Series anchor clip.

2.7 CHANNEL SUPPORT SYSTEM

A. Channel Material: 12 gauge steel.

B. Finishes

1. Phosphate and baked green enamel/epoxy.

2. Pre-galvanized.

3. Electro-galvanized.

4. Hot dipped galvanized.

5. Polyvinyl chloride (PVC), minimum 15 mils thick.

C. Fittings: Same material and finish as channel.

D. UL Listed Systems

1. B-Line Systems Inc.'s B-22 (1-5/8 x 1-5/8 inches), B-12 (1-5/8 x 2-7/16 inches), B-11 (1-5/8 x 3-1/4 inches).

2. Grinell Corp.'s Allied Power-Strut PS 200 (1-5/8 x 1-5/8 inches), PS 150 (1-5/8 x 2-7/16 inches), PS 100 (1-5/8 x 3-1/4 inches).

3. Kindorf's B-900 (1-1/2 x 1-1/2 inches), B-901 (1-1/2 x 1-7/8 inches), B-902 (1-1/2 x 3 inches).

4. Unistrut Corp.'s P-3000 (1-3/8 x 1-5/8 inches), P-5500 (1-5/8 x 2-7/16 inches), P-5000 (1-5/8 x 3-1/4 inches).

5. Versabar Corp.'s VA-1 (1-5/8 x 1-5/8 inches), VA-3 (1-5/8 x 2-1/2 inches).

2.8 MISCELLANEOUS FITTINGS

A. Side Beam Brackets

1. B-Line Systems Inc.'s B102, B103, B371-2

2. Kindorf's B-915

3. Versabar Corp.'s VF-2305, VF-2507

B. Pipe Straps (Heavy Duty Type):

1. Two (2) Hole Steel Conduit Straps:

a. B-Line Systems Inc.'s B-2100 Series
b. Kindorf's C-144 Series
c. Unistrut Corp.'s P-2558 Series

2. One (1) Hole Malleable Iron Clamps:

a. Kindorf's HS-400 Series
b. OZ/ Gedney Co.'s 14-G Series, 15-G Series (EMT)

C. Deck Clamps: Caddy/Erico Products Inc.

D. Supporting Fasteners (Metal Stud Construction): Metal stud supports, clips and accessories as produced by Caddy/Erico Products Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Where specific fasteners are not specified or indicated for securing items to in-place construction, provide appropriate type, size, and number of fasteners for a secure, rigid installation.

B. Install anchoring devices and other fasteners in accordance with manufacturer's printed instructions.

C. Make attachments to structural steel wherever possible.

3.2 FASTENER SCHEDULE

A. Material

1. Use cadmium or zinc coated anchors and fasteners in dry locations.

2. Use hot dipped galvanized or stainless steel anchors and fasteners in damp and wet locations.

3. For corrosive atmospheres or other extreme environmental conditions, use fasteners made of materials suitable for the conditions.

B. Types and Use: Unless otherwise specified or indicated use:

1. Cast-in-place concrete inserts in fresh concrete construction for direct pull-out loads such as shelf angles or fabricated metal items and supports attached to concrete slab ceilings.

2. Anchoring devices to fasten items to solid masonry and concrete when the anchor is not subjected to pull out loads, or vibration in shear loads.

3. Toggle bolts to fasten items to hollow masonry and stud partitions.

4. Metallic fasteners installed with electrically operated or powder driven tools for approved applications, except:

   a. Do not use powder driven drive pins or expansion nails.
   b. Do not attach powder driven or welded studs to structural steel less than 3/16 inch thick.
   c. Do not support a load, in excess of 250 lbs from any single welded or powder driven stud.
   d. Do not use powder driven fasteners in precast concrete

5. Metallic hammer set anchors may be used in wall and ceiling applications. Maximum conduit size supported with hammer set anchors is 1 Inch.

3.3 ATTACHMENT SCHEDULE

A. General: Make attachments to structural steel or steel bar joists wherever possible. Provide intermediate structural steel members where required by support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of 5.

1. Make attachments to steel bar joists at panel points of joists.

2. Do not drill holes in main structural steel members.

3. Use “C” beam clamps for attachment to steel beams.

B. Where it is not possible to make attachments to structural steel or steel bar joists, use the following methods of attachment to suit type of construction unless otherwise specified or indicated on the drawings.

1. Attachment to Steel Roof Decking (No Concrete Fill):

   a. Decking With Hanger Tabs: Use deck clamps.
   b. Decking Without Hanger Tabs:

      1) Before Roofing Has Been Applied: Use 3/8 inch threaded steel rod welded to a 4 x 4 x 1/4 inch steel plate and installed through 1/2 inch hole in roof deck.
      2) After Roofing Has Been Applied: Use welding studs, or self-drilling/tapping fasteners. Exercise extreme care when installing fasteners to avoid damage to roofing.

2. Attachment to Metal Stud Construction: Use supporting fasteners manufactured specifically for the attachment of raceways and boxes to metal stud construction.

   a. Support and attach outlet boxes so that they cannot torque/twist by using one of the following:
      1) Bar hanger assembly.
      2) Box hanger with far side support.
      3) Between stud mounting bracket.

3.4 CONDUIT SUPPORT SCHEDULE

A. Provide number of supports as required by National Electrical Code.

B. Use pipe straps and specified method of attachment where conduit is installed proximate to surface of wood or masonry construction.

1. Use hangers secured to surface with specified method of attachment where conduit is suspended from the surface.

C. Use “C” beam clamps and hangers where conduit is supported from steel beams.

D. Use deck clamps and hangers where conduit is supported from steel decking having hanger tabs.

1. Where conduit is supported from steel decking that does not have hanger tabs, use clamps and hangers secured to decking, utilizing specified method of attachment.

E. Use channel support system supported from structural steel for multiple parallel conduit runs.

F. Where conduits are installed above ceiling, do not rest conduit directly on runner bars, T-Bars, etc.

1. Conduit Sizes 2-1/2 Inches and Smaller: Support conduit from ceiling supports or from construction above ceiling.

2. Conduit Sizes Over 2-1/2 Inches: Support conduit from concrete deck, beams, joists, or trusses above ceiling.

3.5 LIGHTING FIXTURE SUPPORT SCHEDULE

A. General: Do not support fixtures from ceilings or ceiling supports unless it is specified or indicated on the drawings to do so.

1. Support fixtures with hanger rods attached to beams, joists, or trusses. Hanger rod diameter, largest standard size that will fit in mounting holes of fixture.

a. Where approved, channel supports may span and rest upon the lower chord of trusses and be utilized for the support of lighting fixtures.
b. Where approved, channel supports may span and be attached to the underside of beams, joists, or trusses and be utilized for the support of lighting fixtures.

2. Use two (2) nuts and two (2) washers on lower end of each hanger rod to hold and adjust fixture (one (1) nut and washer above top of fixture housing, one (1) nut and washer below top of fixture housing).

a. Where specified that an adequately supported outlet box is to support a fixture or be utilized as one (1) point of support, support the box so that it may be adjusted to bring the face of the outlet box even with surface of ceiling

B. Specific Installations Where Fixtures May Be Supported From New Ceilings Being Installed by the General Contractor:

1. Support recessed mounted fixtures directly from furring members of furred gypsum board ceilings.

2. Support recessed mounted fixtures directly from the suspension system of suspended acoustical ceilings. Exception: Support each fixture weighing more than 50 pounds independent of the suspended ceiling grid.

C. Number of Supports for Ceiling Mounted Lighting Fixtures: Provide at least the following number of supports. Provide additional supports when recommended by fixture manufacturer, or shown on the drawings.

1. Commercial and Industrial LED Fixtures:

a. Support individual fixtures less than two (2) feet wide at two (2) points.
b. Support continuous row fixtures less than two (2) feet wide at points equal to the number of fixtures plus one (1). Uniformly distribute the points of support over the row of fixtures.
c. Support individual fixtures two (2) feet or wider at four (4) corners.
d. Support continuous row fixtures two (2) feet or wider at points equal to twice the number of fixtures plus two (2). Uniformly distribute the points of support over the row of fixtures.
e. An adequately supported outlet box may be utilized as one point of support for fixtures weighing less than 50 pounds.

D. Number of Supports for Wall Mounted Lighting Fixtures: Provide at least the following number of supports. Provide additional supports when recommended by fixture manufacturer, or shown on the drawings.

1. Commercial and Industrial LED Fixtures:

a. Support individual fixtures two (2) feet long or less at two (2) points.
b. Support individual fixtures over two (2) feet long at three (3) points.
c. Support continuous row fixtures at points equal to twice the number of fixtures. Uniformly distribute the points of support.
d. An adequately supported outlet box may be utilized as one (1) point of support for fixtures weighing less than 50 pounds.

3.6 CHANNEL SUPPORT SYSTEM SCHEDULE

A. Use channel support system where specified or indicated on the drawings.

B. Channel supports may be used, as approved, to accommodate mounting of equipment.

C. Material and Finish:

1. Dry Locations: Use 12 gauge steel channel support system having any one of the specified finishes.

2. Damp Locations: Use 12 gauge steel channel support system having any one of the specified finishes except green epoxy/enamel.

3. Wet locations: Use 12 gauge steel channel support system having hot dipped galvanized, or PVC finish.

3.7 ROOFTOP SUPPORT SYSTEM

A. Install in accordance with manufacturer’s instructions and recommendations.

B. Provide complete and adequate support of all conduit, cable tray, or equipment.

C. The use of wood blocks for supporting conduit, cable tray, or equipment is not permitted.

D. If gravel top roof, gravel must be removed around and under support.

E. Consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (isolation pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.

F. Use properly sized clamps to secure conduit, cable tray, or equipment.

END OF SECTION

SECTION 26 0533
RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following conduits, surface raceways, multi-outlet assemblies, auxiliary gutters, wall duct, and boxes for electrical systems including wall and ceiling outlet boxes, floor boxes, and junction boxes.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this section.

1. Section 260529 – Hangers and Supports.

2. Section 262726 – Wiring Devices.

3. Section 262702 – Equipment Wiring.

PART 2 - PRODUCTS

2.1 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Conduit: Steel, galvanized tubing.

B. Fittings:

1. All steel, set screw, concrete tight. No push-on or indenter types permitted.

2. Raintight Fittings:

a. All steel construction with zinc electroplate finish provides for durable corrosion resistance
b. Distinct color to provide quick raintight identification
c. Integral gasketed compression ring secures and seals for reliable installation
d. Gasket on male threads of box connector seals installation for raintight connection between the box and the connector

C. Conduit Bodies: All steel threaded conduit bodies.

2.2 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: steel, galvanized, spiral strip.

B. Fittings and Conduit Bodies: All steel, galvanized, or malleable iron (except as allowed in Specification 265113).

2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: flexible, steel, galvanized, spiral strip with an outer Liquidtight, nonmetallic, sunlight-resistant jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1, compression type. There shall be a metallic cover/insert on the end of the conduit inside the connector housing to seal the cut conduit end.

2.4 CONDUIT SUPPORTS

A. See Section 260529.

2.5 OUTLET BOXES

A. Sheet Metal Outlet Boxes: galvanized steel, with stamped knockouts.

B. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 3/8 inch male fixture studs where required.

C. Cast Boxes: Cast ferroalloy, or aluminum type deep type, gasketed cover, threaded hubs.

2.6 PULL AND JUNCTION BOXES

A. Pull boxes and junction boxes shall be minimum 4 inch square by 2 1/8th inches deep for use with 1 inch conduit and smaller. On conduit systems using 1 1/4 inch conduit or larger, pull and junction boxes shall be sized per NEC but not less than 4 11/16 inch square.

B. Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.

C. Sheet metal boxes larger than twenty-four (24) inches in any dimension shall have a hinged cover or a chain installed between box and cover.

D. Cast Metal Boxes for Outdoor and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron or aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

E. The use of box extension rings is discouraged. If they must be used only one ring per box is allowed and wiring must extend a minimum of 6” beyond the front edge of the extension ring.

F. Box extensions and adjacent boxes within 48” of each other are not allowed for the purpose of creating more wire capacity.

G. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.

H. Wireways shall not be used in lieu of junction boxes.

2.7 GENERAL

A. All steel fittings and conduit bodies shall be galvanized.

B. No cast metal or split-gland type fittings permitted.

C. Mogul-type condulets larger than two (2) inch not permitted except as approved or detailed.

D. All condulet covers must be fastened to the condulet body with screws and be of the same manufacture.

E. Wireways, gutters and c-condulets shall not be used in lieu of pull boxes and condulets.

F. All boxes shall be of sufficient size to provide free space for all conductors enclosed in the box and shall comply with NEC requirements.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. EMT is permitted to be used in sizes 4" and smaller for power and telecommunication systems. See CONDUIT INSTALLATION SCHEDULE below for other limitations for EMT and other types of conduit.

B. Size power conductor raceways for conductor type installed. Conduit size shall be 1/2 inch minimum except all homerun conduits shall be 3/4", or as specified elsewhere. Caution: Per the NEC, the allowable conductor ampacity is reduced when more than three (3) current-carrying conductors are installed in a raceway. Contractor must take the NEC ampacity adjustment factors into account when sizing the raceway and wiring system.

C. Size conduit for all other wiring, including but not limited to data, control, security, fire alarm, telecommunications, signal, video, etc. shall be sized per number of conductors pulled and their cross-section. 40% fill shall be maximum for all new conduit fills.

D. Arrange conduit to maintain headroom and present a neat appearance.

E. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

F. Maintain minimum six (6) inch clearance between conduit and piping. Maintain twelve (12) inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

G. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized pipe straps, conduit racks (lay-in adjustable hangers), clevis hangers, or bolted split stamped galvanized hangers.

H. Group conduit in parallel runs where practical and use conduit rack (lay-in adjustable hangers) constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

I. Do not fasten conduit with wire or perforated pipe straps. Before conductors are pulled, remove all wire used for temporary conduit support during construction.

J. Support and fasten metal conduit at a maximum of eight (8) feet on center.

K. Supports shall be independent of the installations of other trades, e.g. ceiling support wires, HVAC pipes, other conduits, etc., unless so approved or detailed.

L. In general, all conduits shall be concealed except where noted on the drawings or approved by the Architect/Engineer. Contractor shall verify with Architect/Engineer all surface conduit installations except in mechanical, electrical or utility rooms that are not occupied spaces.

M. Changes in direction shall be made with symmetrical bends, cast steel boxes, stamped metal boxes or cast steel conduit bodies.

N. For indoor conduits, no continuous conduit run shall exceed 100 feet without a junction box.

O. All conduits installed in exposed areas shall be installed with a box offset before entering box.

3.2 CONDUIT INSTALLATION

A. Ground and bond conduit under provisions of Section 260526.

B. Cut conduit square; de-burr cut ends.

C. Conduit shall not be fastened to the corrugated metal roof deck.

D. Bring conduit to the shoulder of fittings and couplings and fasten securely.

E. Use conduit hubs for fastening conduit to cast boxes. Use sealing locknuts or conduit hubs for fastening conduit to sheet metal boxes in damp or wet locations.

F. All conduit terminations (except for terminations into conduit bodies) shall use conduit hubs, or connectors with one (1) locknut, or shall use double locknuts (one (1) each side of box wall) and insulated bushing. Provide bushings for the ends of all conduit not terminated in box walls. Refer to Section 260526 – Grounding and Bonding for Electrical Systems for grounding bushing requirements.

G. Install no more than the equivalent of four (4) 90 degree bends between boxes.

H. Use hydraulic one (1)-shot conduit bender or factory elbows for bends in conduit larger than two (2) inch size unless sweep elbows are required.

I. Conduit shall be bent according to manufacturers' recommendations. Torches or open flame shall not be used to aid in bend of PVC conduit.

J. Use suitable conduit caps or other approved seals to protect installed conduit against entrance of dirt and moisture.

K. Provide 1/8 inch nylon pull string in empty conduit, except sleeves and nipples.

L. Install expansion-deflection joints where conduit crosses building expansion joints. Note: expansion-deflection joints are not required where conduit crosses building control joints if the control joint does not act as an expansion joint. Install expansion fitting in PVC conduit runs as recommended by the manufacturer.

M. Avoid moisture traps where possible. Where moisture traps are unavoidable, provide junction boxes with drain fittings at conduit low points.

N. Route conduit through roof openings for piping and ductwork where possible.

O. Conduit is not permitted in any slab topping of two inches or less. Consult Structural Engineer for approval of conduit installed in topping slabs greater than two inches.

P. Maximum Size Conduit in Slabs Above Grade: 3/4 inch. Do not route conduits to cross each other in slabs above grade.

Q. PVC conduit shall transition to galvanized rigid metal conduit before it enters a concrete pole base, foundation, wall (where exposed) or up through a concrete floor.

R. All conduit installed underground (exterior to building) shall be buried a minimum of 24" below finished grade, whether or not the conduit is concrete encased.

1. All underground conduits shall be installed with "DANGER – BURIED ELECTRICAL CONDUIT" red flagging tape 6-inches above conduit. Tape shall be continuous along the conduit run.

2. Tracer wire shall be installed on all exterior electrical utilities. Trace wire to be fourteen (14) gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal, and shall be watertight to provide electrical continuity. Install trace wire in the same trench with the conduit during installation and secure to conduit as required to ensure that the wire remains adjacent to the conduit. Trace wire access points shall in general be no more than 500' apart.

S. PVC conduit shall be cleaned with solvent, and dried before application of glue. The temperature rating of glue/cement shall match weather condition. Apply full even coat of cement/glue to entire area that will be inserted into fitting. The entire installation shall meet manufacturers' recommendations.

3.3 CONDUIT INSTALLATION SCHEDULE

A. Conduit other than that specified below for specific applications shall not be used.

B. Underground Installations Within Five Feet of Foundation Wall: Rigid steel conduit.

C. Underground Installations More than Five Feet From Foundation Wall: Schedule 40 PVC conduit.

D. Directional Boring: HDPE conduit.

E. Under Slab on Grade Installations: Schedule 40 PVC conduit.

F. Exposed Outdoor Locations: Rigid steel conduit

G. Concealed in Concrete and Block Walls: Electrical metallic tubing.

H. Within Concrete Slab: Schedule 40 PVC conduit.

I. Wet Interior Locations: Electrical metallic tubing with raintight fittings

J. Concealed Dry Interior Locations: Electrical metallic tubing.

K. Exposed Dry Interior Locations: Electrical metallic tubing.

L. Motor and equipment connections: Flexible PVC coated metal conduit (all locations). Minimum length shall be one foot, maximum length shall be three feet. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.

M. Light fixtures: Direct box or conduit connection for surface mounted and recessed fixtures. Flexible metal conduit from a J-box for recessed lay-in light fixtures. Conduit size shall be 3/8" minimum diameter and six (6) foot maximum length. Conduit length shall allow movement of fixture for maintenance purposes.

3.4 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. No outlet, junction, or pull boxes shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.

D. Boxes shall not be fastened to the underside of metal roof deck.

E. It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.

F. In case of any question over the location of an outlet, the Contractor shall refer the matter to the Owner/Engineer and install outlet as instructed by the Owner/Engineer.

G. The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.

H. Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18 inch by 24 inch access doors.

3.5 OUTLET BOX INSTALLATION

A. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. The front edge of the box, plaster ring, extension ring, or listed extender shall not be set back of the finished wall surface more than ¼" in accordance with NEC 314.20. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

B. Do not install boxes back-to-back in walls. Provide minimum 6 inch separation, except provide minimum 24 inch separation in acoustic-rated walls.

C. Power

1. Recessed (1/4" maximum) outlet boxes in masonry, concrete or tile construction shall be minimum 4 inch square, with device rings. Device covers shall be square-cut except rounded corner plaster rings are allowed in drywall applications. Angle cut plaster rings are not permitted. Coordinate masonry cutting to achieve neat openings for boxes.

D. Low Voltage

1. Recessed (1/4" maximum) outlet boxes in masonry, concrete or tile construction shall be minimum 4-11/16" square, 2-1/8" deep. Device covers shall be square-cut except

rounded corner plaster rings are allowed in drywall applications. Angle cut plaster rings are not permitted. Coordinate masonry cutting to achieve neat openings for boxes.

E. Provide knockout closures for unused openings.

F. Support boxes independently of conduit except for cast boxes that are connected to two (2) rigid metal conduits, both supported within twelve (12) inches of box.

G. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide non-metallic barriers to separate wiring of different voltage systems.

H. Install boxes in walls without damaging wall insulation.

I. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

J. Ceiling outlets shall be four (4) inch square, minimum 2-1/8 inch deep except that concrete boxes and plates will be approved where applicable. Position outlets to locate luminaires as shown on reflected ceiling plans.

K. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.

L. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

M. Provide cast ferroalloy or aluminum outlet boxes in exterior and wet locations.

3.6 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings, in unfinished areas or furnish and install access panels in non-accessible ceilings where boxes are installed. All boxes are to be readily-accessible.

B. Support pull and junction boxes independent of conduit.

END OF SECTION

SECTION 26 0553
IDENTIFICATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the labeling of power, lighting, general wiring, signal, fire alarm, and cabling.

1.2 REFERENCES

A. Applicable provisions of Division 1 shall govern work under this section.

B. Section 260519 – Low Voltage Electrical Power Conductors and Cables

PART 2 - PRODUCTS

2.1 MATERIALS

A. Labels: All labels shall be permanent, and machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS ARE ALLOWED. Exception: Back side of device plates and junction boxes may use handwritten, legible labeling on box covers, unless specifically prohibited by other specification sections.

B. Cable label size shall be appropriate for the conductor or cable size(s), outlet faceplate layout and patch panel design. All labels shall be self-laminating, white/transparent vinyl and be wrapped around the cable or sheath. Labels for power conductors (600V and lower) shall be cloth-type. Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.

C. Nameplates: Engraved three-layer laminated plastic, white letters on a black background. Emergency system (Level 1 and Level 2) shall use white letters on red background.

D. Tape (phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase.

E. Adhesive type labels not permitted except for phase and wire identification. Machine generated adhesive labels shall be permitted for device plates, 4-11/16” and smaller junction boxes, fire alarm and control devices.

PART 3 - EXECUTION

3.1 GENERAL

A. All branch circuit and power panels must be identified with the same symbol used in circuit directory in main distribution center.

B. Clean all surfaces before attaching labels with the label manufacturer's recommended cleaning agent.

C. Install all labels firmly as recommended by the label manufacturer.

D. Labels shall be installed plumb and neatly on all equipment.

E. Install nameplates parallel to equipment lines.

F. Secure nameplates to equipment fronts using screws, rivets or manufacturer approved adhesive or cement.

G. Embossed tape will not be permitted for any application.

3.2 JUNCTION AND PULLBOX IDENTIFICATION

A. Provide circuit numbers, and source panel designations for power wiring on the inside cover of the junction/pull box. Other system shall be identified as shown on details or approved shop drawings. Temperature control shall identify the source.

3.3 POWER AND CONTROL WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

B. All wiring shall be labeled within 2 to 4 inches of terminations. Each end of a wire or cable shall be labeled as soon as it is terminated including wiring used for temporary purposes.

3.4 WIRING DEVICE IDENTIFICATION

A. Wall switches, line voltage wall dimmers, motor switches, receptacles (interior, exterior, floor boxes, etc.), photocells and time clocks shall be identified with circuit numbers and source. Labeling shall be permanent and machine generated. Label shall have 1/4" black text on a clear label. Label shall be installed at consistent location on the face of the device cover plate.

3.5 NAMEPLATE ENGRAVING

A. Provide nameplates of minimum letter height as scheduled below.

B. Panelboards, Switchboards and Motor Control Centers: 1 inch; identify equipment designation. 1/2 inch; identify voltage rating, source and room location of the source.

C. Equipment Enclosures: 1 inch; identify equipment designation. 1/2 inch; identify voltage rating, source and room location of the source where applicable.

D. Circuit Breakers, Switches, and Motor Starters/VFD's in Panelboards or Switchboards or Motor Control Centers: 1/2 inch; identify circuit and load served, including location.

E. Individual Circuit Breakers, Disconnect Switches, Enclosed Switches, Motor Starters, and VFD's: 1/2 inch; identify source and load served.

F. Junction boxes: 1 inch; identify system source(s) and load(s) served. Junction boxes may be neatly identified using a permanent marker.

3.6 PANELBOARD DIRECTORIES

A. Typed directories for panels must be covered with clear plastic, have a metal frame. Room number on directories shall be Owner's numbers, not Plan numbers unless Owner so specifies.

3.7 ARC FLASH LABELS

A. Install ARC FLASH WARNING signs on all switchboards, panelboards, and motor control centers.

END OF SECTION

SECTION 26 0925
OCCUPANCY SENSORS FOR LIGHTING CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following occupancy sensors for lighting control and building automation interface (where noted) indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

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

1.3 SUBMITTALS

A. Submit product data under provisions of specification section 260500 Common Work Results.

B. Product Data: For each type of product indicated.

C. Submit a lighting plan clearly marked by manufacturer showing proper product, location, and orientation of each sensor. Sensor quantity, location, and aiming shall be determined by the manufacturer based on 100% coverage of the spaces. Device locations shown on the plans are for basis of design only and shall not be used for submittals.

1.4 CLOSEOUT SUBMITTALS

A. Operating and maintenance instructions.

B. Record drawings of network system. Show physical routing of cables and location of system devices.

C. Cable testing documentation for CAT5/CAT5E/CAT6 field terminated cabling.

1.5 QUALITY ASSURANCE

A. Products supplied shall be from a single manufacturer that has been continuously involved in manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.

B. All components shall be U.L. listed and meet all state and local applicable code requirements.

C. Wall switch products must be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.

1.6 SUMMARY

A. Contractor’s work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and

furnishing of a completely operational occupancy sensor lighting control system, as described herein.

B. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 26.

C. Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

D. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits

E. Contractor, in accordance with manufacturer's recommendation, shall determine final sensor location.

F. All applicable products must be UL Listed or other acceptable national testing organization.

1.7 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section general requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site. Store and protect under provisions of specification section 260500 Common Work Results.

1.9 WARRANTY

A. Products shall carry a five (5)-year warranty.

PART 2 - PRODUCTS

2.1 AVAILABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Building Automation
2. Watt Stopper (The)
3. Sensor Switch
4. Cooper Controls/Greengate
5. Leviton

2.2 GENERAL WALL SWITCH SENSOR REQUIREMENTS

A. Wall switch sensor shall recess into single gang switch box and fit a standard GFI opening.

B. Sensor must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.

C. Wall switch sensor with built-in override control (off-auto). Furnish the model which suits the electrical system parameters, and accommodates the square footage coverage and wattage requirement for each area (and type of lighting) controlled.

D. Wall switch products shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.

E. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.

F. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads

G. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.

H. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

I. Where specified, sensor shall have an additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options.

J. In areas with inboard/outboard switching, sensor shall provide two (2) dedicated relays and override switches.

2.3 INFRARED WALL SWITCH SENSORS

A. Passive infrared sensors shall utilize detection technology to respond only to those signals caused by human motion

B. Passive infrared sensors shall provide high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise on the line).

C. Where specified, passive infrared ultrasonic and dual technology sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage (minor motion in office environments) to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are

diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.

B. It is the contractor’s responsibility to arrange a pre-installation meeting with manufacturer's factory authorized representative, at Owner's facility, to verify placement of sensors and installation criteria

C. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the Owner's facility, the training necessary to familiarize the Owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

D. Ceiling sensors shall not be installed within six (6) – eight (8) feet of HVAC outlets or heating blowers.

E. Power packs and relays shall be installed at accessible locations. Coordinate installation with other systems and architectural ceilings to determine final power pack and relay locations.

3.2 WIRING

A. All control wiring should be installed and terminated by a qualified installer and should follow standard wiring installation practices.

B. Provide wiring types as noted in the shop drawings or manufacturer’s literature.

C. Provide a minimum 6’ service loop in the cable at the ceiling sensor location to allow for sensor relocation if necessary.

D. Sensors and devices that employ the use of CAT5/CAT5E/CAT6 cabling shall use factory terminated cables or field terminated cables for interconnectivity. All field terminated cables shall be labeled and tested prior to installation.

3.3 FIELD QUALITY CONTROL

A. Where applicable, adjust sensitivity so that controlled area is lighted when area is occupied.

B. Adjust time delay so that controlled area remains lighted for five (5) minutes after occupant leaves area. Coordinate with the Owner for different time delay settings to meet specific room requirements.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the main, distribution and branch circuit panelboards indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

A. Include outline and support point dimensions, voltage, main bus ampacity, and integrated short circuit ampere rating.

B. Circuit breaker enumeration (frame, ATE, poles, I.C.): Indicate if circuit breakers are suitable for the panelboards' Fully Rated Equipment Rating, or where acceptable, are series connected devices that have been test verified and listed with UL (include documentation proving the compatibility of the proposed circuit breaker combinations). Circuit breakers do not have to be listed as series connected devices when all of the circuit breaker interrupting ratings are equal to, or greater than, the short circuit rating of the panelboard.

C. When indicated on the panelboard schedule, a coordinated selective scheme between the main circuit breaker and branch/feeder circuit breakers so that under fault conditions the branch/feeder circuit breaker clears the fault while the main circuit breaker remains closed.

D. Accessories.

1.4 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver panelboards in factory-fabricated water-resistant wrapping..

B. Handle panelboards carefully to avoid damage to material components, enclosure and finish.

C. Store in a clean, dry space and protected from the weather.

1.6 EXTRA MATERIALS

A. Keys: Furnish two (2) keys for each panelboard to Owner.

PART 2 - PRODUCTS

2.1 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: Circuit breaker type.

B. UL label “SUITABLE FOR USE AS SERVICE EQUIPMENT” where used as service equipment.

C. Enclosure: Type 3R. Minimum cabinet size: 5-3/4 inches deep; 20 inches wide with 5" minimum gutter space top and bottom. Constructed of galvanized code gauge steel.

D. Provide surface cabinet fronts with concealed trim clamps, concealed hinge and flush cylinder lock all keyed alike. Front cover shall be hinged to allow access to wiring gutters without removal of panel trim. Hinged trim shall be held in place with screw fasteners. Finish in manufacturer's standard gray enamel.

E. Provide flush cabinet fronts with concealed trim clamps, concealed hinge and flush cylinder lock all keyed alike. Finish in manufacturer's standard gray enamel.

F. Provide metal directory holders with clear plastic covers.

G. Provide panelboards with copper bus (phase buses, bus fingers, etc.), ratings as scheduled on Drawings. Provide ground bars in all panelboards. Neutral and ground bars can be dual rated ALCU9. All spaces shall have bus fully extended and drilled for the future installation of breakers.

H. Minimum System (i.e. individual component) Short Circuit Rating: As shown on the Drawings.

I. Molded Case Circuit Breakers: Bolt-on type thermal magnetic trip circuit breakers. Provide UL Class A ground fault interrupter circuit breakers where shown on Drawings. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Breakers 225 ampere through 400 ampere shall have continuously adjustable magnetic pick-ups of approximately five to ten times trip rating.

J. Do not use tandem circuit breakers.

K. Circuit breakers shall be bolt-on type with common trip handle for all poles. No handle ties of any sort will be approved.

L. Shunt trip breakers shall be provided where indicated.

M. Ground fault breakers shall be provided where indicated.

N. All of the panelboards provided under this section shall be by the same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. See specification section 260529 Hangers and Supports.

B. Install panelboards plumb with wall finishes.

C. Height: 6 ft to top.

D. Install a crimp type stud termination to stranded conductor when terminating on circuit breakers without a captive assembly rated for terminating stranded conductors.

E. Provide filler plates for unused spaces in panelboards.

F. See specification section 260553 Identification. Provide typed circuit directory for each branch circuit panelboard. Circuit labels shall indicate actual loads served. Use final room numbers and names of equipment. Do not use panel directories used for construction purposes. Revise directory to reflect circuiting changes required to balance phase loads.

G. Provide ARC flash identification per NFPA 70E.

H. Stub five (5) empty 1” conduits to accessible location above ceiling or below floor out of each recessed panelboard. Cap these conduits to prevent material from entering them.

I. Keep panel interior clean at all times.

J. Cabinet exteriors shall be maintained free of mud, spray-on insulation, paint spray and all substances not placed on the exterior surface by the panelboard manufacturer.

K. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims, doors, and boxes with finishes to match surrounding surfaces after the panelboards have been installed.

L. Panel cabinets shall not be used as raceways or pull boxes for adjacent equipment. Panel cabinets shall not contain wire splices. Panel wiring shall be installed in a neat and workmanlike manner with wire conforming to the contours of the cabinet. Wire bundles shall be wire tied and installed in a manner to protect wire insulation from cover screws and other sharp edges. All phase conductors shall be labeled with a circuit number, readily visible to the panelboard front without removing the dead front cover. All neutral conductors shall be labeled with the circuit number, which they are associated with, within three inches of their termination point

M. Where new panels are to be installed in existing backboxes, backboxes shall have rust and scale removed from inside. Paint inside of backboxes with rust preventive paint before the new panel interior is installed. Provide new trim and doors for these panels. Covers shall fit tight to the box with no gaps between the cover and the box.

3.2 FIELD QUALITY CONTROL

A. The Contractor shall circuit the panelboards as shown on the drawings. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 10 percent, rearrange circuits in the panelboard to balance the phase loads within 10 percent.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections.

END OF SECTION

SECTION 26 2702
EQUIPMENT WIRING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the electrical connections indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section may be specified under other Divisions and/or Sections, or furnished by Owner, including, but not limited to:

1. HVAC motors, VFDs, and panels

2. Plumbing motors, VFDs, and panels

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

B. Section 260533 Raceway and Boxes for Electrical Systems.

C. Section 260519 Low-Voltage Electrical Power Conductors and Cables.

1.3 COORDINATION

A. Coordinate all equipment requirements with the various contractors and the Owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

A. Straight-blade Attachment Plug: NEMA WD 1.

B. Locking-blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermoset insulated multiconductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

2.2 OTHER PRODUCTS

A. Refer to related sections for other product requirements.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make conduit connections to equipment using flexible PVC-coated metal conduit.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

3.4 HVAC AND PLUMBING CONNECTIONS

A. Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.

B. VFD Installations: Install VFD input wiring and output wiring in separate conduit systems. Do not mix VFD input power and output power, or control wiring in a common raceway.

C. Provide 120 volts to each temperature control panel. Coordinate requirements with HVAC/DDC contractors.

D. Unless otherwise specified, all electrical motors and control devices such as aquastats, float and pressure switches, fan powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired by the Contractor supplying the devices.

E. Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.

F. Check for proper rotation of each motor.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following wiring devices indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section

1. Wall switches
2. Receptacles
3. Device plates and box covers

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

A. Provide product data showing model numbers, configurations, finishes, dimensions, and manufacturer's instructions.

1.4 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state, and local requirements, and shall conform to codes and ordinances of authorities having jurisdiction.

B. Provide factory fabricated wiring devices in the type and electrical rating for the service indicated. Where type and grade are not indicated provide proper selection to correspond with branch circuit wiring and overcurrent protection.

C. Attachment of wires to devices shall be by screw pressure under the head of binding screws. Arrangements depending on spring pressure or tension are not acceptable. All binding screws shall be brass or bronze.

D. See Drawings for Device Schedule.

2.2 DEVICE COLOR

A. Gray, unless noted otherwise.

2.3 WALL SWITCHES

A. Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: Quiet-type single pole through four (4)-way.

B. Heavy duty use toggle switch, nylon or high impact resistant face and body, rated 20 amperes and 120/277 volts AC.

C. Switches shall be UL20 Listed and meet Federal Specification WS-896. All switches shall be heavy duty Specification Grade with separate green ground screw.

D. All switches shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG.

2.4 KEYED SWITCHES

A. Keyed switches shall have the same requirements as wall switches except for a key operator in lieu of a toggle switch.

B. Provide one (1) key per switch to the Owner.

2.5 STRAIGHT-BLADE RECEPTACLES

A. Nylon or high impact resistant face, NEMA configuration as scheduled on the Drawings.

B. Receptacles shall be UL498 Listed and meet Federal Specification WC-596.

C. All receptacles shall be back and side wired, screw clamp type, suitable for solid or stranded wire up to #10 AWG, with a separate green ground screw. Connector-type receptacles are also acceptable.

2.6 GROUND FAULT CIRCUIT INTERRUPTER (GFCI) RECEPTACLES

A. Duplex convenience receptacle, Specification Grade, with integral ground fault current interrupter, auto monitoring (self-test), and line-load reversal function meeting the requirements of UL standard 943 Class A and UL standard 498.

B. All receptacles installed in outdoor locations, in garages, within six (6) feet of the outside edge of sinks, and in other damp or wet locations shall be GFCI type.

2.7 WALL DIMMERS

A. Wall Dimmers: Linear slide type or electronic to match the load served. Loads may include the following:

1. LED lighting

B. Rating: 600 Watts minimum, larger size to accommodate load shown on Contract Drawings.

2.8 DEVICE PLATES AND BOX COVERS

A. Cover Plate

1. Finished Spaces: Smooth thermoplastic nylon.

2. Unfinished Spaces: Smooth thermoplastic nylon.

3. Mechanical and Electrical Rooms: Smooth thermoplastic nylon.

B. Weatherproof Cover Plate: Gasketed plastic with hinged cover, wet location listed while in use.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All dimensions noted are centerline dimensions.

B. Install wall switches 42 inches above floor, OFF position down.

C. Install wall dimmers 42 inches above floor; de-rate ganged dimmers as instructed by manufacturer; do not use common neutral.

D. Install convenience receptacles 18 inches above floor, 6 inches above counters or backsplash, grounding pole on bottom. Mount horizontally where indicated.

E. Install specific-use receptacles at heights shown on Contract Drawings.

F. Receptacles shall have a bonding conductor from grounding terminal to the metal conduit system. Self-grounding receptacles using mounting screws as bonding means are not approved.

3.2 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.3 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Mark all conductors with the panel and circuit number serving the device with a machine generated label, at the device, and on the back of the device cover.

END OF SECTION

SECTION 26 2728
DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install disconnect switches, fuses and enclosures indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

A. Include outline drawings with dimensions, and equipment ratings for voltage, ampacity, horsepower, and short circuit.

1.4 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Fusible Switch Assemblies (use only when overcurrent protection is required): NEMA Type Heavy Duty; quick-make, quick-break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: designed to accommodate Class R cartridge type fuses.

B. Nonfusible Switch Assemblies: NEMA Type Heavy Duty; quick-make, quick-break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Solid neutral bus when neutral conductor is included with circuit.

D. Provide manufacturer’s equipment ground kit in all disconnect switches.

E. Enclosure: NEMA Type as indicated on Drawings.

F. Current rating and number of poles as indicated on drawings.

2.2 FUSES

A. Fuses 600 Amperes and Less: Dual element, time delay, 250 volt, UL Class RK 5. Interrupting Rating: 200,000 rms amperes.

B. Provide three (3) spares of each size and type fuse. Provide enclosure for spare fuse.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install switches so that the maximum height above the floor to the center of the operating handle does not exceed 6'-6".

C. Provide identification as specified in Section 260553.

END OF SECTION

SECTION 26 4313
SURGE PROTECTION DEVICES (SPDs)

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install surge protection devices (SPD) as indicated by the Contract Documents with supplementary items necessary for proper installation.

1.2 REFERENCES

A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

B. IEEE C62.41 Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

1.3 SUBMITTALS

A. The following information shall be submitted to the Engineer:

1. Product data and manufacturer's installation instructions.

B. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum:

1. Model number.
2. SPD Type.
3. System voltage, phases.
4. Modes of protection.
5. Voltage Protection Rating (VPR).
6. Nominal Discharge Current (In).

C. For sidemount mounting applications (SPD mounted external to electrical assembly), electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.

1.4 QUALITY ASSURANCE

A. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years.

B. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

C. The specified system shall be thoroughly factory tested before shipment. Testing of each system shall include but shall not be limited to quality control checks, dielectric voltage withstand tests at twice rated voltage plus 1000 volts per UL requirements, and operational and calibration tests.

1.5 SUMMARY

A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, busway (integrated within bus plug), or motor control centers.

1.6 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

B. Section 262416 – Panelboards

1.7 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer’s instructions.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided with each SPD shipped.

1.9 WARRANTY

A. The manufacturer shall provide a full five (5) year warranty from date of shipment against any part failure when installed in compliance with manufacturer's written instructions, UL listing requirements, and any applicable national or local electrical codes. Manufacturer shall make available field engineering service support.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Square D

B. Siemens

C. General Electric

D. Eaton Cutler-Hammer

E. Mersen

F. Erico/Critec

G. Liebert

H. Current Technology

2.2 VOLTAGE SURGE SUPPRESSION – GENERAL

A. Electrical Requirements

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.

2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 125% of the nominal system operating voltage.

3. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

4. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall be rejected.

5. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277
L-N; L-G; N-G	700	1200
L-L	1200	2000

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life.

2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV.

3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method.

4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.

5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:

   a. Protection Status Indicators - Each unit shall have an indicator light that reports the status of the protection on each phase.

      1) For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional indicator light that reports the status of the protection elements and circuitry in the N-G mode.
      2) For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.

   b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.

   c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

   d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs.

      1) The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Overcurrent Protection

   a. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly.

8. Safety Requirements

a. Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit. Sidemount SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation.

2.3 SYSTEM APPLICATION

A. The SPD applications covered under this section include branch panel locations. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
Category	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switchboards, Switchgear, MCC, Main Entrance)	250 kA	125 kA
B	High Exposure Roof Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

C. SPD Type – all SPDs installed on the line side of the service entrance disconnect shall be Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

2.4 LIGHTING AND DISTRIBUTION PANEL REQUIREMENTS

A. Sidemount Mounting Applications Installation (SPD mounted external to electrical assembly):

1. Lead length between the breaker and suppressor shall be kept as short as possible to ensure optimum performance. Any excess conductor length shall be trimmed in order to minimize let-through voltage. The installer shall comply with the manufacturer's recommended installation and wiring practices.

2.5 ENCLOSURES

A. All enclosed equipment shall have NEMA 1 general purpose enclosures, unless otherwise noted. Provide enclosures suitable for locations as indicated on the drawings and as described below:

1. NEMA 1 – Constructed of a polymer (units integrated within electrical assemblies) or steel (sidemount units only), intended for indoor use to provide a degree of protection to

personal access to hazardous parts and provide a degree of protection against the ingress of solid foreign objects (falling dirt).

2. NEMA 4 – Constructed of steel intended for either indoor or outdoor use to provide a degree of protection against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (dirt and windblown dust); to provide a degree of protection with respect to the harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure. (sidemount units only)

3. NEMA 4X – Constructed of stainless steel providing the same level of protection as the NEMA 4 enclosure with the addition of corrosion protection. (sidemount units only)

PART 3 - EXECUTION

3.1 FACTORY TESTING

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.2 INSTALLATION

A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

END OF SECTION

SECTION 26 5113
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the equipment indicated in the Contract Documents with supplementary items necessary for a proper and functioning installation.

B. Section Includes:

1. Interior luminaires

2. Exit signs

1.2 REFERENCES

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

B. Refer to Division 26 Section “Low Voltage Electrical Power Conductors and Cables” for wiring requirements

C. Refer to Division 26 Section “Emergency Lighting” for emergency battery ballasts, emergency lighting units, exit signs with battery backup and lighting inverter systems.

1.3 SUBMITTALS

A. Product data:

1. For each luminaire type, submit a technical cut sheet with complete model number(s) and included options clearly noted, plus luminaire support points, weight, accessory information and photometric performance data indicating total luminaire efficiency. Place luminaire type (e.g. ‘F1’) at the top of each cut sheet page for that luminaire.

2. Submit a technical cut sheet for the associated driver proposed for that luminaire. When multiple luminaires use the same driver, a single cut sheet for the driver may be submitted with all luminaires utilizing that driver clearly labeled on the cut sheet.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit under requirements and format listed in Division 26 Section “Common Work Results”.

B. Include the following documentation

1. All required submittals for this section, updated to reflect required changes from review comments.

2. Warranty letter(s) indicating dates of coverage and warranty claim contact information.

1.5 QUALITY ASSURANCE

A. Electrical components and accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

B. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

1.6 DEFINITIONS

A. LEED: Leadership in Energy and Environmental Design

B. CRI: Color rendering index

C. CCT: Correlated color temperature

D. BUG: Backlight, Uplight and Glare ratings for luminaires based on IESNA TM-15-07.

1.7 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported from structure, including HVAC equipment, fire-suppression system, and partition assemblies.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver luminaires in factory-fabricated packaging.

B. Handle lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures.

C. Store product in a clean, dry space protected from weather.

1.9 WARRANTY

A. All equipment shall be warranted to be free of defects in materials and workmanship by the manufacturer for the time period listed below from the date of project substantial completion:

1. LED luminaires (including LED power supply): Five (5) years

1.10 EXTRA MATERIAL

A. Special Tools - Two (2) tools to remove and install each type and size of fasteners on fixtures equipped with vandal resistant fasteners.

B. Deliver replacement stock as directed to Owner's storage space.

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES

A. Refer to the Luminaire Schedule on the drawings for types of luminaires (e.g. F1, F2, EM1, etc.). The luminaire type listed in the schedule will appear on the lighting plans adjacent to the symbol for each luminaire.

B. For each luminaire type the manufacturer and model listed first in the schedule, in conjunction with all other luminaire attributes listed on the schedule, shall be considered the basis of design. The remaining acceptable manufacturers shall meet or exceed the performance of the basis of design. When a discrepancy exists between the model number and the other attributes listed for that luminaire, the Contractor shall ask for clarification during the bidding process or include the more expensive option as part of their bid.

C. Provided luminaire doors with rubber, fiberglass gaskets or equivalent material to prevent light leak. Luminaires shall be provided with proper thermal protection as required for surrounding environment.

D. Acrylic lenses shall be prismatic and not less than 0.125-inches thick nominal, unless noted otherwise on plans.

E. All luminaire finishes shall be factory applied unless specifically noted otherwise. Refer to schedule on drawings for finish color.

2.2 SOLID STATE LUMINAIRES

A. Photometric Measurement: Comply with IESNA LM-80-21.

B. Lumen Maintenance: Tested in accordance to IESNA LM-79-19.

C. Long Term Lumen Maintenance: Comply with IESNA TM-21-11.

D. The basis of design for each LED luminaire is listed on the Luminaire Schedule. All other listed acceptable manufacturers shall meet or exceed the delivered lumens of the basis of design using +/- 10% input watts.

E. CRI and CCT per Luminaire Schedule on plans

2.3 EXIT SIGNS

A. Mounting type and chevrons shall be as indicated on the Drawings. Lettering and chevron-type directional indicators shall comply with NFPA 101, Life Safety Code, and shall be Listed in accordance with UL 924, Standard for Safety Emergency Lighting and Power Equipment.

B. Sign housing type shall be as indicated on the Luminaire Schedule.

C. Mounting canopies will be of identical construction and color to match the exit frame.

2.4 LED POWER SUPPLIES

A. Acceptable manufacturers: Selected and tested by luminaire manufacturer with specified luminaire for compatibility and performance.

B. Provide with 0-10 VDC dimming interface when specified on Luminaire Schedule on plans.

C. LED power supplies shall have temperature and a moisture rating suitable for the environments for which it is to be installed. Luminaires installed in low ambient temperature areas shall have power supplies specifically designed for low temperature operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install luminaires at locations and heights as indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA Standards and with recognized industry practices to ensure that luminaires fulfill requirements.

B. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

C. Check the building electrical system requirements and architectural finishes. Regardless of the catalog number prefixes and suffixes shown, furnish fixtures with the proper trim, frames, supports, hangers, driver, voltage rating, and other miscellaneous appurtenances to properly coordinate with Project conditions. Verify with Engineer prior to ordering.

D. Check the type of ceilings to be installed in each room and verify that the recessed light fixtures are proper for the type of ceiling to be installed before ordering fixtures. Provide a frame compatible with the type of ceiling in which the recessed lighting fixture is installed. Refer to the Architectural Room Finish Schedule for the specified ceiling type.

E. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Heavy duty jack chain supports may be used where indicated on the fixture schedule. Provide pendant or chain length required to suspend luminaire at indicated height.

F. Support luminaires larger than 2 x 4 foot size independent of ceiling framing using #12 steel wires anchored to structure.

G. Locate ceiling luminaires as indicated on the architectural reflected ceiling plan.

H. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

I. Finishing Collar or Combination Finishing Collar/Outlet Box (Surface Mounted Fixture Used With Exposed Raceway):

1. Provide finishing collar where surface mounted fixture is installed on an exposed raceway outlet box and the fixture base is larger than the outlet box.

2. Provide combination finishing collar/outlet box where surface mounted fixture is not indicated to be installed on an exposed raceway outlet box, but raceway cannot be run directly into fixture body due to fixture design.

J. The Contractor shall install fixture supports as required. Fixture installations with fixtures supported only by insecure boxes will be rejected. It shall be the Contractor's responsibility to support all lighting fixtures adequately, providing extra steel work for the support of fixtures if

required. Any components necessary for mounting fixtures shall be provided by the Contractor. No plastic, composition or wood type anchors shall be used.

K. Install recessed luminaires to permit removal from below.

L. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

M. Install wall mounted luminaires at height as scheduled.

N. Install accessories furnished with each luminaire.

O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

P. Bond fixtures and metal accessories to branch circuit equipment grounding conductor.

Q. Protect installed fixtures from damage during the remainder of the construction period.

3.2 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Aim and adjust luminaires as indicated on Drawings or as directed by the Architect/Engineer.

C. Touch up luminaire finish at completion of work.

3.3 FIXTURE CONNECTIONS

A. Direct box or conduit connections for surface and recessed fixtures. Flexible metal conduit from a J-box for recessed lay-in light fixtures. Flexible metal conduit shall be minimum 3/8" diameter and six foot maximum length. Conduit length shall allow movement of the fixture for maintenance purposes.

B. The flexible connectors shall be all steel, galvanized, clamp type with locknut or snap-in connector including those used on the master-slave unit.

C. Fixture whips shall be supported to prevent them from lying on or being supported by the ceiling grid. Supports shall be listed for raceway support. Tape and other temporary means are not acceptable.

3.4 FIELD QUALITY CONTROL

A. Upon completion of installation of interior lighting fixtures, and after circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at the Project Site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

B. All existing fixtures in work area that are re-used or relocated shall be cleaned inside and out, broken or damaged parts replaced and new lamps installed.

END OF SECTION

SECTION 26 5200
EMERGENCY LIGHTING-UNIT EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following emergency lighting-unit equipment indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment included in this Section

1. Emergency lighting units

2. Exit signs

1.2 REFERENCES

A. Applicable provisions of Division 1 govern work under this Section.

1.3 SUBMITTALS

A. Include outline drawings, lamp and ballast data, battery/charger information, support points, weights, accessory information and performance data for each luminaire type.

B. For each luminaire type, submit luminaire information in the following example table format, and submit catalog cuts with highlighted catalog numbers and required accessories.

LUMINAIRE		BALLAST	LAMP	ANSI INPUT WATTS
Type	Manufacturer and Catalog No.	Manufacturer, Quantity per Fixture, and Catalog No.	Manufacturer, Quantity per Fixture, and Catalog No.	

1.4 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver lighting fixtures individually wrapped in factory-fabricated fiberboard type containers.

B. Handle lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures.

C. Store product in a clean, dry space protected from weather.

PART 2 - PRODUCTS

2.1 EXIT/EMERGENCY LIGHTING AND ACCESSORIES

A. See the Luminaire Schedule on the drawings, for type of fixtures and catalog numbers. Catalog numbers are shown on the drawings for quality and performance requirements only. Fixtures manufactured by others are equally acceptable provided they meet or exceed the performance of the indicated fixtures, and meet the intent of the design.

B. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 REMOTE LIGHTING HEADS

A. Remote head mounting shall be as indicated on the Drawings.

B. Housing material shall be as indicated on the Drawings.

C. Lamp type, quantity, voltage, and wattage shall be as indicted on the Drawings.

D. Units shall comply with NFPA 101, Life Safety Code, and shall be Listed in accordance with UL 924, Standard for Safety Emergency Lighting and Power Equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

C. Check the building electrical system requirements and architectural finishes. Regardless of the catalog number prefixes and suffixes shown, furnish fixtures with the proper trim, frames, supports, hangers, ballasts, voltage rating, and other miscellaneous appurtenances to properly coordinate with Project conditions. Verify with Engineer prior to ordering.

D. Check the type of ceilings to be installed in each room and verify that the recessed light fixtures are proper for the type of ceiling to be installed before ordering fixtures. Provide a frame compatible with the type of ceiling in which the recessed lighting fixture is installed. Refer to the Architectural Room Finish Schedule for the specified ceiling type.

E. Install suspended luminaires using pendants supported from swivel hangers. Chain or cable supports may be used in unfinished spaces or where indicated on the fixture schedule. Provide pendant, chain, or cable length required to suspend luminaire at indicated height.

F. Fixture whips shall be supported to prevent them from lying on or being supported by the ceiling grid. Supports shall be listed for raceway support. Tape and other temporary means are not acceptable.

G. Locate exit and emergency luminaires as indicated on the Drawings. Install accessories furnished with each luminaire.

H. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

I. Finishing Collar or Combination Finishing Collar/Outlet Box (Surface Mounted Fixture Used With Exposed Raceway):

1. Provide finishing collar where surface mounted fixture is installed on an exposed raceway outlet box and the fixture base is larger than the outlet box.

2. Provide combination finishing collar/outlet box where surface mounted fixture is not indicated to be installed on an exposed raceway outlet box, but raceway cannot be run directly into fixture body due to fixture design.

J. The Contractor shall install fixture supports as required. Fixture installations with fixtures supported only by insecure boxes will be rejected. It shall be the Contractor's responsibility to support all lighting fixtures adequately, providing extra steel work for the support of fixtures if required. Any components necessary for mounting fixtures shall be provided by the Contractor. No plastic, composition or wood type anchors shall be used.

K. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

L. Bond fixtures and metal accessories to branch circuit equipment grounding conductor.

M. Protect installed fixtures from damage during the remainder of the construction period.

N. Insert a copy of the battery warranty in each unit and mark on batteries the date placed in service.

O. Emergency Lighting Units

1. Units shall be mounted so that they may easily be removed for service.

2. Units shall be permanently connected to a 120/277 volt power source in compliance with the NEC.

3. Remote lamps shall be connected to battery unit using raceway and wire size noted on the Drawings.

P. Emergency Ballasts and Generator Transfer Device

1. Install in accordance with manufacturer’s instructions.

2. Where provided, install remote test/monitoring plate and location indicated on the Drawings.

3.2 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Aim and adjust luminaires as indicated on Drawings or as directed by the Architect/Engineer.

C. Touch up luminaire finish at completion of work.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of interior lighting fixtures, and after circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at the Project Site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

END OF SECTION

SECTION 31 2000
EARTHWORK

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.

B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

D. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.

E. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.

F. ASTM C869/C869M - Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete; 2024.

G. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2012 (Reapproved 2022).

H. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

I. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

J. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).

K. ASTM D2940/D2940M - Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports; 2020.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. Section Includes:
   1. Excavating and filling for rough grading the Site.
   2. Preparing subgrades for slabs-on-grade.
   3. Excavating and backfilling for buildings and structures.
   4. Drainage course for concrete slabs-on-grade.

1.04 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation

and replacement material will be paid for according to Contract provisions for unit prices or changes in the Work.

2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and interior slab on grade.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct pre-excavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
   a. Over-excavation and backfill under building footprint, as indicated on the drawings.
   b. Personnel and equipment needed to make progress and avoid delays.
   c. Coordination of Work with utility locator service.
   d. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
   e. Extent of trenching by hand or with air spade.
   f. Field quality control.

1.06 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D698.

1.07 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: "One Call" for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.

E. Do not commence earth-moving operations until plant-protection measures are in place.

F. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
   1. Low plasticity: LL of 45 or less and PI of 23 or less.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Granular Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Compacted Granular Fill / Backfill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C33/C33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting , low-density, flowable concrete material produced from the following:
   1. Portland Cement: ASTM C150/C150M, Type I.
   2. Fly Ash: ASTM C618, Class C or F.
   3. Normal-Weight Aggregate: ASTM C33/C33M 3/4-inch nominal maximum aggregate size.
   4. Foaming Agent: ASTM C869/C869M.
   5. Water: ASTM C94/C94M.
   6. Air-Entraining Admixture: ASTM C260/C260M.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches outside of concrete forms other than at footings.

b. 12 inches outside of concrete forms at footings.
c. 6 inches outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches beneath bottom of concrete slabs-on-grade.
f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or wide.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
a. 24 inches outside of concrete forms other than at footings.
b. 12 inches outside of concrete forms at footings.
c. 6 inches outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches beneath bottom of concrete slabs-on-grade.
f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or wide.

3.05 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:
1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according as required.

3.06 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
   2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices or changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.07 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
   1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.09 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring, bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.
   5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95percent.
   2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
   3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
   4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.
   3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

3.15 SUBBASE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact subbase course under cast-in-place concrete slabs-on-grade as follows:
   1. Place subbase course 4 inches or less in compacted thickness in a single layer.
   2. Compact each layer of subbase course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.16 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Paving assemblies.

B. Reinforcement.

C. Concrete materials.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 07 9200 - Joint Sealants: Sealing joints.

1.03 REFERENCE STANDARDS

A. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

B. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

C. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.

F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

G. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

H. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2024.

1.04 SUBMITTALS

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

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI SPEC-301.

B. Parking Area Pavement: 4,000 psi 28 day concrete, 5 inches thick, 6 by 6 - W2.9 by W2.9 mesh reinforcement, wood float finish.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) yield strength; deformed billet steel bars; unfinished.

B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.

C. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi yield strength; deformed billet steel bars; unfinished finish.

2.03 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03 3000.

2.04 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1, Class A.

2.05 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

2.06 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. Prepare subbase in accordance with State of Iowa Highways standards.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

B. Do not place concrete when base surface is wet.

C. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.05 JOINTS

A. Align joints with adjacent surfaces.

B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.

1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
2. Secure to resist movement by wet concrete.

C. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.06 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Curbs and Gutters: Light broom, texture parallel to pavement direction.

3.07 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.08 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement until 75 percent design strength of concrete has been achieved.

END OF SECTION

SECTION 32 9223
SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Sod installation.

1.02 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.03 REFERENCE STANDARDS

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

1.04 SUBMITTALS

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

B. Certificate: Certify grass species and location of sod source.

C. Certificate: Certify fertilizer and herbicide mixture approval by authority having jurisdiction.

D. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.05 QUALITY ASSURANCE

A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Iowa.

B. Installer Qualifications: Company approved by the sod producer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets. Protect exposed roots from dehydration.

B. Do not deliver more sod than can be laid within 24 hours.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.

B. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay, or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare subgrade in accordance with Section 31 2000

B. Place topsoil in accordance with Section 32 2000.

3.02 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately after delivery to site to prevent deterioration.

C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.

D. Where new sod adjoins existing grass areas, align top surfaces.

E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.

F. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

G. Prior to placing sod, on slopes exceeding 8 inches per foot or where indicated, place wire mesh over topsoil. Securely anchor in place with wood pegs sunk firmly into the ground.

H. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

I. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

3.03 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean surrounding areas of construction debris.

3.04 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Maintain turf to produce healthy turf, uniform in color and leaf texture, and free from weeds and other undesirable growth.
   1. Grass Density - Lawns: 20 plants per sq ft, minimum.
   2. Bare Spots - Lawns: 2 percent of total area, maximum; 6 inches square, maximum.
   3. Keep turf relatively free of thatch, woody plant roots, diseases, nematodes, soilborne insects, stones larger than 1 inch in diameter, and other materials detrimental to grass growth.
   4. Limit broadleaf weeds and patches of foreign grass to maximum of 2 percent of total area.

C. Resodding: Comply with requirements of this section.

D. Cleanup:
   1. Clean adjacent pavements of plant debris and other debris generated by maintenance activities.
   2. Remove and dispose of general cleanup debris and biodegradable debris; Owner's trash collection facilities may be used.
   3. Remove and dispose of general cleanup debris and biodegradable debris.
      a. Biodegradable Debris: Deposit biodegradable debris in Owner's designated on-site compost pile; branches and bark are not considered biodegradable.
      b. Branches and Bark: Machine-chip branch and bark debris; deposit resulting debris in Owner's designated wood chip storage area.
      c. Non-Biodegradable Debris: Owner's trash collection facilities may be used.

END OF SECTION