PROJECT MANUAL

IOWA STATE FAIR

SWINE BARN
UPDATES – PHASE 2

DES MOINES, IOWA

March 10, 2026

Contract Project No. 251001.00
ISF Project No. CSWB2601

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 Barn Updates - Phase 2, located at: Iowa State Fairgrounds, Des Moines, Iowa..

B. Contract Project Number 251001.00.

C. Owner's Project Number: CSWB2601.

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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NOTICE TO BIDDERS

THE IOWA STATE FAIR BOARD OF DIRECTORS (OWNER) WILL RECEIVE BIDS TO PERFORM CONSTRUCTION FOR THE PROJECT TITLED "ISF SWINE UPDATES - PHASE 2" LOCATED ON THE IOWA STATE FAIRGROUNDS, DES MOINES, IOWA.

A PRE-BID MEETING FOR PROSPECTIVE BIDDERS WILL BE HELD AT THE MAINTENANCE BUILDING, IOWA STATE FAIRGROUNDS, DES MOINES, IOWA, AT 2:00 P.M. LOCAL TIME, MONDAY, MARCH 23, 2026.

BIDS WILL BE RECEIVED BY THE OWNER AT THE IOWA STATE FAIR ADMINISTRATION BUILDING, IOWA STATE FAIRGROUNDS, DES MOINES, IOWA, ON OR BEFORE 2:00 P.M., LOCAL TIME, TUESDAY, APRIL 7, 2026.

INTERESTED BIDDERS MAY OBTAIN A SET OF BIDDING DOCUMENTS AFTER MARCH 10, 2026, 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

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   2. Intent
   3. Work Identified in Contract Documents
   4. Contract Time

B. Bid Documents and Contract Documents
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   1. Duration of Offer
   2. Acceptance of Offer

1.02 RELATED DOCUMENTS

A. Section 00 1113 - Notice to Bidders.

B. Section 00 4100 - Bid Form.

C. Section 00 4336 - Proposed Subcontractors Form.

D. Document 00 4322 - Unit Prices Form.

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

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

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

H. Section 00 7300 - Supplementary Conditions.

I. Section 01 1000 - Summary.

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INVITATION

2.01 BID SUBMISSION

A. BIDS WILL BE RECEIVED BY THE OWNER AT THE IOWA STATE FAIR ADMINISTRATION BUILDING, IOWA STATE FAIRGROUNDS, DES MOINES, IOWA, ON OR BEFORE 2:00 P.M., LOCAL TIME, TUESDAY, APRIL 7, 2026.

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 Barn Updates - Phase 2 for multiple Stipulated Sum contracts, 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, electrical, and site Work.

B. Contractors may propose on one or all of the following contracts:
   1. STRUCTURAL STEEL - Contract CSWB2601-051.
   2. GENERAL CONSTRUCTION - Contract CSWB2601-061.
   3. MECHANICAL/PLUMBING - Contract CSWB2601-023.
   4. ELECTRICAL/COMMUNICATIONS - Contract CSWB2601-026.
   5. SITEWORK will be a separate contract, but is not bid in these Contract Documents. Sitework drawings are provided with the Contract Documents for reference only.

2.04 CONTRACT TIME

A. Work is envisioned to follow the Phasing Diagram included within the Drawings. Contractor may propose edits to the proposed phasing. The proposed phasing is outlined below:
   1. Coordinate start of Phase A construction with approval of contract and working with Owner's activities. Only begin work that can be complete prior to the 15th of June 2026, so entire building is useable for the 2026 Fair. Otherwise, no construction will occur prior to the 2026 Fair. Contractor shall remove all work materials, trailers, stored items, clean, and vacate site by the 15th of June 2026.
   2. Remobilize and begin work of Phase A after the 15th of September 2026.
   3. Complete all Phase A work so entire building is useable for the 2027 Fair. Contractor shall remove all work materials, trailers, stored items, clean, and vacate site by the 15th of June 2027.
   4. Remobilize and begin work of Phase B after the 15th of September 2027.
   5. Complete all work within this contract by the 15th day of June, 2028.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

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

B. Contract Documents: Defined in AIA A201 Article 1 including issued Addenda.

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

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

3.02 CONTRACT DOCUMENTS IDENTIFICATION

A. Contract Documents are identified in Project Manual as Contract Project Number 251001.00, and with Iowa State Fair Project Number CSWB2601.

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.

4.02 PREBID CONFERENCE

A. A PRE-BID MEETING FOR PROSPECTIVE BIDDERS WILL BE HELD AT THE MAINTENANCE BUILDING, IOWA STATE FAIRGROUNDS, DES MOINES, IOWA, AT 2:00 P.M. LOCAL TIME, MONDAY, MARCH 23, 2026. The purpose of this meeting is to answer questions and discuss matters pertaining to the Project.

B. All general contract and subcontract bidders and suppliers are invited.

C. Representatives of the Owner, Architect, and Engineers will be in attendance.

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

QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS

A. To demonstrate qualification for performing the Work of this Contract, the low bidders for each Contract will be required to submit AIA A305 prior to contract award.
   1. A draft copy of the AIA A305 Form is available at this link - https://bit.ly/4b7MXGu.

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, invalidate the bid.

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 no less than five percent (5%) of the Bid Price, made payable to the Owner, or an executed

AIA A310 Bid Bond form or form approved by the Owner for the same 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.

B. Include the cost of Performance Bond in the Bid Amount.

7.03 INSURANCE

A. Provide an executed "Undertaking of Insurance" on a standard form provided by the insurance company 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 concurrent with bid submission:
   1. Document 00 4322 - Unit Prices Form: Include a listing of unit prices specifically requested by Contract Documents.

B. 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
East 30th and University Avenue
Des Moines, Iowa 50317

1.02 FOR:

A. Project: ISF Swine Barn Updates - Phase 2

B. Owner Project Number: CSWB2601.

C. Contract Project Number: 251001.00.

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. Contractor may bid on one, all, or the specified combination of the contracts below. The Owner may at their discretion choose bids from one or multiple qualified contractors which best meet the requirements of the project:

B. Base Bid Contract CSWB2601-051 STRUCTURAL STEEL: 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:

_____ dollars

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

C. Base Bid Contract CSWB2601-061 GENERAL CONSTRUCTION: 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:

_____ dollars

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

D. Base Bid Contract CSWB2601-023 MECHANICAL/PLUMBING: 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:

_____ dollars

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

E. Base Bid Contract CSWB2601-026 ELECTRICAL/COMMUNICATIONS: 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:

_____ dollars

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

F. If choosing to combine bids - at a minimum bidders must combine Contracts:
   1. CSWB2601-061 GENERAL CONSTRUCTION.
   2. CSWB2601-023 MECHANICAL/PLUMBING.
   3. CSWB2601-026 ELECTRICAL/COMMUNICATIONS.

   Place an X next to the Contract Combinations you are bidding below:

   [ ] CSWB2601-051 STRUCTURAL STEEL

   [ ] CSWB2601-061 GENERAL CONSTRUCTION

   [ ] CSWB2601-023 MECHANICAL/PLUMBING

   [ ] CSWB2601-026 ELECTRICAL/COMMUNICATIONS

   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 combined contracts for the Sum of:

   _____ dollars

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

G. We have included the required security Bid Bond as required by the Instruction to Bidders.

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

I. All applicable federal taxes are included and State of Iowa taxes are included in the Bid Sum(s).

J. All Cash Allowances described in Section 01 2100 - Allowances are included in the Bid Sum(s).

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 Contract Time indicated 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 _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.10 BID FORM SUPPLEMENTS

A. The following Supplements are attached to this Bid Form and are considered an integral part of this Bid Form:
   1. Document 00 4322 - Unit Prices Form: Include a listing of unit prices specifically requested by Contract Documents.

B. 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 4322
UNIT PRICES FORM

PARTICULARS

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

1.02 (BIDDER)_____.

1.03 TO (OWNER): IOWA STATE FAIR

1.04 DATED_____AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

1.05 THE FOLLOWING ARE UNIT PRICES FOR SPECIFIC PORTIONS OF THE WORK AS LISTED, AND ARE APPLICABLE TO AUTHORIZED VARIATIONS FROM THE CONTRACT DOCUMENTS.

UNIT PRICE LIST

2.01 FOR THE FOLLOWING ITEM DESCRIPTIONS AND UNIT QUANTITIES INSERT THE UNIT STIPULATED SUM VALUE TO BE USED FOR ADDITIONS OR DELETIONS TO THE WORK SHOWN IN THE CONTRACT:

2.02 PER CUBIC FOOT OF BRICK MASONRY REBUILD:

$_____/CF

2.03 PER SINGLE BROKEN BRICK MASONRY REPLACEMENT:

$_____/UNIT

2.04 PER SINGLE BROKEN SOLID BRICK MASONRY (NO CORES) REPLACEMENT:

$_____/UNIT

2.05 PER LINEAR FOOT OF BRICK WASH REMOVE AND REINSTALL:

$_____/LF

2.06 PER SQUARE FOOT OF BRICK MASONRY REPOINTING:

$_____/SF

2.07 PER LINEAR FOOT OF CONCRETE OR MASONRY MOVEMENT JOINT SEALANT REPAIR:

$_____/LF

2.08 PER LINEAR FOOT OF CONCRETE STEM WALL REPAIR/PATCHING:

$_____/LF

2.09 PER SQUARE FOOT OF WOOD DECKING REPLACEMENT:

$_____/SF

2.10 PER SINGLE WOOD RAFTER SISTER OR REPLACEMENT (SANDWICH RAFTER WITH IDENTICAL SIZED MEMBERS, FULL LENGTH TO BEAR ON PURLINS EACH END):

$_____/UNIT

2.11 PER SINGLE WOOD RAFTER TAIL SISTER OR REPLACEMENT (SANDWICH RAFTER WITH IDENTICAL SIZED MEMBERS, FULL LENGTH OF OVERHANG TO EXTEND TWO PURLINS INSIDE OF STRUCTURE):

$_____/UNIT

2.12 PER LINEAR FOOT OF WOOD 2X6 NAILER REPLACEMENT:

$_____/LF

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 A305 - Contractor's Qualification Statement; 2020.

D. AIA A310 - Bid Bond; 2010.

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

F. AIA G701 - Change Order; 2017.

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

H. AIA G703 - Continuation Sheet; 1992.

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

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

K. 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 BASED ON THE DOCUMENT ATTACHED TO THIS LINK

A. Use AIA Document A101 - 2017 - https://bit.ly/3Z9iQH7

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

A. Use AIA Document A201 - 2017 as modified with the Supplementary Conditions - https://bit.ly/3KlYKFp.

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. Employee - $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 Occurrence - $2,000,000
   Damage to Rented Premises (ea. occurrence) - $100,000
   Med Exp (any one person) - $10,000
   Personal & Adv Injury - $2,000,000
   General Aggregate - $4,000,000
   Products - Comp/OP Agg - $4,000,000
2. Umbrella Liability:
   Each Occurrence - $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 Barn Updates - Phase 2

B. Owner's Name: Iowa State Fair.

C. Design Professionals as identified in Section 00 0102 - Project Information.

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

1.02 CONTRACT DESCRIPTION

A. Contract Type: Multiple prime contracts each 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.

C. The work of each separate prime contract is identified in this section and on Drawings.

1.03 DESCRIPTION OF WORK AND ALTERATIONS WORK

A. Scope of all construction work is defined on the Drawings and as follows:
   1. Demolition for new construction.
   2. Interior Concrete Slabs.
   3. Concrete Footings and Foundations.
   4. Ground Faced Masonry Installation.
   5. Masonry Restoration and Repair
   6. Cast Stone Assemblies.
   7. Structural Steel Framing.
   8. Steel Decking.
   9. Metal Fabrications.
   10. Wood Decking Repair.
   11. Rough Carpentry.
   12. Glue-Laminated Construction.
   13. PVC Trim.
   14. Fiberglass Reinforced Paneling.
   15. Wool Insulation.
   16. TPO Roofing.
   17. Roof Hatches and Ladders.
   18. Sheet Metal Flashing and Trim.
   19. Gutters and Downspouts.
   20. Joint Sealants.
   21. Hollow Metal Doors and Frames.
   22. Door Hardware.
   23. Clad Wood Doors.
   24. Glazing.
   25. Gypsum Board Assemblies.
   26. Acoustical Ceilings.
   27. Painting.
   28. Fire Extinguishers and Cabinets.
   29. Plumbing.
   30. Mechanical.
   31. Electrical.
   32. Communications.
   33. Earthwork Under Slabs and for Excavations.

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

C. Scope of alterations work is indicated on drawings.

1.04 WORK BY OWNER

A. Owner will supply and install the following:
   1. Solid Surface integral sinks, counters, and backsplashes.
   2. Signage and Room Signage.

B. Contract CSWB2601-061 - GENERAL CONSTRUCTION will be responsible for providing all blocking, accessories, fasteners, site prep, and field modifications to install all Owner supplied items, and Owner supplied and installed items.
   1. Contractor shall coordinate with the Owner prior to the Owner's of ordering items by providing field measurements and review of Owner supplied shop drawings.

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.

F. The Owner will remove select electrical and lighting items prior to construction. All items that remain will be the responsibility of the contractor to remove prior to the start of work.

G. The Owner will locate and maintain key survey and control points for the use of all Contracts. Each Contract is responsible to provide their own survey and field measuring work based on Owner provided information to complete the work within their Contract.

1.05 OWNER OCCUPANCY

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

B. Coordinate with Owner's event schedule which might prohibit work during certain days or hours depending on nearby site use.

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

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

E. Schedule the Work to accommodate Owner occupancy.

F. 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.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

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. Each Contract shall provide progress cleaning of their own materials.

D. 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.
3. Provide a means of roof access to the Owner, Architect, and/or Engineers during construction.

E. Coordinate with Owner to use existing building spaces for storage.
1. Space and access is limited at certain times coordinate all storage and delivery of items to site.

F. Time Restrictions:
1. Limit conduct of especially noisy exterior work to the hours of 7:00AM to 5:00PM.
2. Complete work between the hours of 7:00AM to 5:00PM, from Monday through Friday, unless otherwise indicated.

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

H. Smoking or use of controlled substances is not permitted.

1.07 WORK SEQUENCE

A. See Contract Time and Phasing as described in Section 00 2113 - Instructions to Bidders.

1.08 SPECIFICATION SECTIONS APPLICABLE TO EVERY CONTRACT

A. Unless otherwise noted, provisions of all the Sections included in Division 00 -- Procurement and Contracting Requirements, and Division 01 -- General Requirements apply to every contract. Specific items of work listed under individual contract descriptions constitute exceptions.

1.09 CONTRACT CSWB2601-051 - STRUCTURAL STEEL

A. Perform all work identified above in paragraph - Specification Sections Applicable To Every Contract.

B. Perform all work identified in the following Sections to support work as identified in the Structural Drawings:
1. 02 4100 - Demolition
   a. For removal of Structural Seel Items only.
2. 05 1200 - Structural Steel.
3. 05 3100 - Steel Decking.
4. 05 5000 - Metal Fabrications.
5. 06 1800 - Glue-Laminated Construction.

C. Perform all work required to complete the Structural Steel Contract for the Specification Sections listed above and as shown in Drawings SD101, SD102, SD103, and Structural Drawings.

1.10 CONTRACT CSWB2601-061 - GENERAL CONSTRUCTION

A. Perform all work identified above in paragraph - Specification Sections Applicable To Every Contract.
1. Include all work in Sections 02 4100 - Demolition, and 05 5000 - Metal Fabrications not completed to support the work of any other Contract.
   a. Coordinate Demolition with Contracts MECHANICAL/PLUMBING - Contract CSWB2601-023, and ELECTRICAL/COMMUNICATIONS - Contract CSWB2601-026

to limit removal of items or systems required for completed work. Replace items with new if items or systems required are removed.

b. Structural Steel items shall be removed by Contract STRUCTURAL STEEL - Contract CSWB2601-051.

B. Perform all work identified in all Sections to support all work as shown in the Drawings not provided within the following Contracts:
   1. STRUCTURAL STEEL - Contract CSWB2601-051.
   2. MECHANICAL/PLUMBING - Contract CSWB2601-023.
   3. ELECTRICAL/COMMUNICATIONS - Contract CSWB2601-026.
   4. SITEWORK (as shown in the Civil Drawings provided with the Contract Documents for reference only).

C. Perform all work shown in the Drawings not included in the Contracts listed above and as shown in Demolition Drawings (exclude Drawings SD101, SD102, SD103) and Architectural Drawings.

1.11 CONTRACT CSWB2601-023 - MECHANICAL/PLUMBING

A. Perform all work identified above in paragraph - Specification Sections Applicable To Every Contract.

B. Perform all work needed for trenching or underground work as required in Section 31 2000 - Earthwork and all work in Sections included within Division 22 -- Plumbing, and Division 23 -- Mechanical to support work as identified in the Plumbing Drawings, and Mechanical Drawings.

C. Perform all work required to complete the Mechanical/Plumbing Contract for the Specification Sections listed above and as shown in Plumbing Drawings, and Mechanical Drawings.

1.12 CONTRACT CSWB2601-026 - ELECTRICAL/COMMUNICATIONS

A. Perform all work identified above in paragraph - Specification Sections Applicable To Every Contract.

B. Perform all work needed for trenching or underground work as required in Section 31 2000 - Earthwork, and all work in Sections included within Division 26 -- Electrical, and Division 27 -- Communications to support work as identified in the Electrical Drawings, and Communications Drawings.

C. Perform all work required to complete the Electrical/Communications Contract for the Specification Sections listed above and as shown in Electrical Drawings, and Communications Drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Change procedures.

1.02 RELATED REQUIREMENTS

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

B. Section 01 2200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

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 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts .

B. Costs Not Included in Cash Allowances: Product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing.

C. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products, suppliers , and installers.
   2. Select products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Change Order.

D. Contractor Responsibilities:
   1. Assist Architect in selection of products, suppliers , and installers.
   2. Obtain proposals from suppliers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier .
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
   5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
   6. Begin work only after Change Order approval.

E. Show Cash Allowance as a line item on the Pay Application.
   1. Differences in costs will be adjusted by Change Order.

1.04 ALLOWANCES SCHEDULE

A. Include the stipulated sum of $75,000.00 for the CSWB2601-061 GENERAL CONSTRUCTION Contract for additional work, unanticipated conditions, or scope not defined in the Drawings, or within the Specifications related to masonry, wood, or concrete repairs. Items are further defined in Section 01 2200 - Unit Prices. Contractor shall provide coordination, and installation of all items, assemblies, and systems as indicated within the Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2200
UNIT PRICES

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.

B. Document 00 4322 - UNIT PRICES FORM: List of Unit Prices as supplement to Bid Form

C. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

D. COSTS INCLUDED

E. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 MEASUREMENT OF QUANTITIES

A. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

B. Assist by providing necessary equipment, workers, and survey personnel as required.

C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

D. Measurement by Area: Measured by square dimension using mean length and width or radius.

E. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

F. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

G. Do not begin Unit Price work unless measurement quantities have been approved and written authorization has been given for a contract modification.

1.04 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

1.05 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 one of the following remedies:
   1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect.
   2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Architect to assess the defect and identify payment adjustment is final.

1.06 SCHEDULE OF UNIT PRICES

A. PER CUBIC FOOT OF BRICK MASONRY REBUILD.

B. PER SINGLE BROKEN BRICK MASONRY REPLACEMENT.

C. PER SINGLE BROKEN SOLID BRICK MASONRY (NO CORES) REPLACEMENT.

D. PER LINEAR FOOT OF BRICK WASH REMOVE AND REINSTALL.

E. PER SQUARE FOOT OF BRICK MASONRY REPOINTING.

F. PER LINEAR FOOT OF CONCRETE OR MASONRY MOVEMENT JOINT SEALANT REPAIR.

G. PER LINEAR FOOT OF CONCRETE STEM WALL REPAIR/PATCHING.

H. PER SQUARE FOOT OF WOOD DECKING REPLACEMENT.

I. PER SINGLE WOOD RAFTER TAIL SISTER OR REPLACEMENT (SANDWICH RAFTER WITH IDENTICAL SIZED MEMBERS, FULL LENGTH TO BEAR ON PURLINS EACH END).

J. PER SINGLE WOOD RAFTER TAIL SISTER OR REPLACEMENT (SANDWICH RAFTER WITH IDENTICAL SIZED MEMBERS, FULL LENGTH OF OVERHANG TO EXTEND TWO PURLINS INSIDE OF STRUCTURE).

K. PER LINEAR FOOT OF WOOD 2X6 NAILER REPLACEMENT.

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. Contract CSWB2601-061 - GENERAL CONSTRUCTION shall Record minutes and distribute copies within two days after meeting to participants, with 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. Contract CSWB2601-061 - GENERAL CONSTRUCTION shall record minutes and distribute copies within two days after meeting to participants, with 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. Contract CSWB2601-061 - GENERAL CONSTRUCTION shall record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

A. Within 20 days after date of the Agreement, Contract CSWB2601-061 - GENERAL CONSTRUCTION shall coordinate with all contracts and submit a preliminary construction 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 all Contracts and all major Subcontractors have reviewed and accepted proposed schedule.

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

E. Contract CSWB2601-061 - GENERAL CONSTRUCTION shall submit an updated schedule including anticipated progress of each contract 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; 2026.

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; 2025b.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2026.

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 if required by a Section shall employ and pay for services of an independent testing agency to perform 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, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. 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.

C. 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. Contract CSWB2601-061 - GENERAL CONSTRUCTION shall 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. Contract CSWB2601-061 GENERAL CONSTRUCTION shall install construction fence around work site. See Phasing Diagram in Drawings for layout.

1. Construction: Commercial grade chain link fence.
2. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 INTERIOR ENCLOSURES

A. 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. All Contracts shall provide waste removal facilities and services as required to maintain the site in a 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.

E. Site must be maintained clean and organized. Loose debris or trash is not permitted at ant time.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

G. Final Cleaning will be under Contract CSWB2601-061 GENERAL CONSTRUCTION.

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.

C. Provide a copy of all Construction Documents on site - not limited to but including Drawings, Specifications, Addendum, RFI's, and ASI's.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove all containers, trailers, staged items, and materials from site between Phase A and Phase B operations. Re-establish all items on site to begin Phase B.

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

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

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

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

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

PART 2 PRODUCTS - NOT USED

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.

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.

Q. All plumbing fixtures must be protected during construction. Scratches to fiberglass surfaces of shower units will not be tolerated. Scratched shower units and plumbing fixtures will be required to be replaced prior to substantial completion.

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 02 4100 - Demolition: Demolition of structures and parts thereof; utility demolition.

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 incorrect fabrication.

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. Contractor shall locate and protect survey control and reference points.

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

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

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

G. Utilize recognized engineering survey practices.

H. 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.

I. Periodically verify layouts by same means.

J. 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 rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. 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.
   5. 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. Execute final cleaning after Substantial Completion but before making final application for payment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy. Building and site must be clean between Phase A and Phase B work.

B. Use cleaning materials that are nonhazardous.

C. 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.

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

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

F. Clean filters of operating equipment.

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

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

I. 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.
   1. Minimum of 10 years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: See Section 31 2000.

PART 3 EXECUTION

3.01 DEMOLITION

A. Remove masonry walls, structural steel, concrete slab, curbs, foundations, mechanical, plumbing, electrical, and wood framing required to accomplish new work.

B. Remove paving and curbs required to accomplish new work.

C. Within area of new construction, remove existing foundation walls and footings entirely.

D. Remove concrete slabs on grade as indicated on drawings.

E. Contractor must protect edges of existing slab to remain from damage prior to installation of new concrete or new construction.

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. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

C. 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.
   5. Protect edges or undercut concrete removal near new concrete edge until right before installation of new material.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove and dispose debris, junk, and trash from site in an approved demolition landfill site in accordance to local regulatory requirements.

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; 2026.

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; 2025.

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/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.

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.

B. Civil Drawings are provided within the Documents for reference which include interior concrete slab and utility work.

1.03 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete, including concrete materials, mixture design, including formwork, reinforcement, placement procedures, and finishes.
      a. For footings and foundations, slabs on grade, and concrete stem walls.

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. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
11. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
12. Intended placement method.
13. 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 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 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. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
      a. Use Imported Sand: Verify it is clean, washed, free of organic matter, clay, silt, and salts, and sharp rather than rounded.

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.

E. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
   1. Application: Use at all exposed concrete floors.
   2. Vehicle: Solvent-based.
   3. Solids by Mass: 25 percent, minimum.
   4. VOC Content: OTC compliant.
   5. Manufacturers:
      a. Kaufman Products Inc; Krystal 25 OTC, or Krystal 25 Emulsion: www.kaufmanproducts.net.
      b. Kaufman Products Inc; Krystal 30 OTC, or Krystal 30 Emulsion: www.kaufmanproducts.net.
      c. W. R. Meadows, Inc; CS-309 OTC: www.wrmeadows.com.
      d. W. R. Meadows, Inc; CS-309-25: www.wrmeadows.com.
      e. W. R. Meadows, Inc; CS-309-30 OTC: www.wrmeadows.com.
      f. W. R. Meadows, Inc; TIAH OTC: www.wrmeadows.com.
      g. SpecChem; Cure & Seal 25; www.specchemllc.com

F. Concrete Sealer with Salt Defense: colorless, low-VOC, odorless, water-based penetrating, chemically reactive, siliconate, concrete sealer.
   1. Reduces urine absorption into concrete.
   2. Reduces spalling due to freeze-thaw.
   3. Solids: 42 percent.
   4. Solubility: 100% in water.
   5. VOC compliant.
   6. Manufacturer: SealGreen; Kennel Concrete Sealer: www.sealgreen.com - https://sealgreen.com/kennel-concrete-concentrate-sealer-with-salt-defense-technology/.

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.

2.09 MISCELLANEOUS MATERIALS

A. Slab isolation joint filler: Flexible, lightweight, non-Staining, polypropylene, closed-cell expansion joint filler conforming to ASTM D1751.
   1. Size: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
      a. Product: W. R. Meadows, Inc; x-foam: www.wrmeadows.com.

B. Vapor Barrier: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464- 7834, www.stegoindustries.com.
   1. Maintain permeance of less than 0.01 Perms [grains/(ft2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
   2. Strength: ASTM E1745 Class A.
   3. Thickness: 15 mils minimum.
   4. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.
   5. Warranty: (a) compliance with the designated ASTM E1745 classification, and (b) no manufacturing defects in the product for, at least, the Life of the Building.

C. Seam Tape: Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

D. Sealing Penetrations of Vapor barrier:
   1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
   2. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

E. Perimeter/terminated edge seal:
   1. Stego Crete Claw (textured tape) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
   2. Stego Term Bar by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
   3. StegoTack Tape (double-sided sealant tape) by Stego Industries LLC, (877) 464- 7834 www.stegoindustries.com.
   4. One-sided seaming tape is not a recommended method of sealing at the terminated edge.

F. Penetration Prevention: Beast Foot by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

G. Vapor Barrier-Safe Hand Screed System: Beast Screed by Stego Industries, LLC, (877) 464-7834 www.stegoindustries.com.

H. Anti-Bonding Agent: "Thompson's Water Seal" as manufactured by A. E. Thompson, Inc., California or approved equivalent.

I. Control Joint Filler: Flexible, single-component polyurethane sealant with backer rod compliant with ASTM C 920, Type S, Grade P, Class 25. Apply sealant per manufacturers written recommendations.
   1. Acceptable Products:

a. Dayton Superior - Perma 230 SL.
b. Euclid Chemical Company - Eucolastic 1SL.
c. BASF Corporation - MasterSeal SL 1.

J. Insulation: See Section 07 2100 - XPS rigid insulation under slab and at perimeter foundation walls.

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.
5. Place Board insulation under slabs and on the warm side of foundation walls as indicated on Drawings and in Section 07 2100 - Thermal Insulation.

3.03 VAPOR BARRIER INSTALLATION

A. Contact vapor barrier manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation

B. Install vapor barrier under all interior slabs on grade in accordance ASTM E1643.
1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, water stops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
3. Seal vapor barrier to the entire perimeter wall or footing/grade beam with manufacturer’s double-sided tape, or both termination bar and double-sided tape, per manufacturer’s instructions. Ensure the concrete is clean and dry prior to adhering tape.
4. Overlap joints 6 inches and seal with manufacturer’s seam tape.
5. Apply seam tape/textured tape/double-sided tape to a clean and dry vapor barrier.
6. Seal all penetrations (including pipes) per manufacturer’s instructions.
7. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not leave punctures in the vapor barrier.
8. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

3.04 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.

3.05 JOINTS

A. Locate joints as indicated on drawings.

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

C. 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.

D. Anchor joint fillers and devices to prevent movement during concrete placement.

E. Isolation joints: use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

F. 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. Avoid raveling (ragged edges), sawcut prior to formation of shrinkage cracks.
a. Saw cut contraction joints: saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
b. Follow requirements for Hot weather (shorter wait times), and Cold weather (longer wait times) saw cutting.

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

H. Load transfer construction and contraction joints: install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.
1. Contraction joint devices: use preformed joint device, with top set flush with top of slab.

I. Construction joints: where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 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 bleed water appears on the surface.
   8. Do not further disturb slab surfaces before starting finishing operations.

3.07 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.

3.08 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/E1155M, 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.

3.09 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.

3.10 CONCRETE CURING

A. Apply Curing and Sealing Compound to all new concrete slabs.

B. 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.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing immediately after finishing concrete.
2. Concrete Floors: apply Curing and Sealing Compound to meet manufacturer's instructions.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 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.

3.13 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.

3.14 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/E1155M within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.15 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.

3.16 SCHEDULE

A. Sawcut joints in new concrete to not be greater than 8 x 8 foot segments. Align new joints with joints in adjoining nearby existing concrete. Verify layout with Architect prior to pouring concrete. Install polyurethane sealant as specified in Section 07 79200 in all joints of concrete slab.

B. Install under slab and perimeter foundation wall rigid board insulation locations as shown on Drawings in Restroom Groups B and C, and as indicated in Section 07 2100 - Thermal insulation.

C. Install new Under Slab Vapor Retarder and Concrete at locations of new or removed concrete as shown on Drawings in Restroom Groups B and C.

END OF SECTION

SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water and Chemical 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 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for additional unit price requirements.

1.04 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).

1.05 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.

B. Scheduling:
   1. Perform cleaning and washing of masonry between the hours of 7am to 7pm only.

1.06 SUBMITTALS

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

B. Product Data: Provide data on cleaning solutions, repair mortar, and other applied or used products.

C. Shop Drawings: Indicate locations of rebuilt, repaired, and replaced masonry. Detail shoring, bracing, and temporary or permanent support.

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

1.07 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.

1.08 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Restore and repoint an existing masonry wall area sized 6 feet long by 3 feet high; in 3 different locations on structure, include in mock-up area instances of mortar, accessories, wall openings, and flashings.

C. Clean a 10 ft by 10 ft panel of wall to determine extent of cleaning.
   1. Repeat, using different cleaning methods for up to three different panels.

D. Locate where directed.

E. Acceptable panel and procedures employed will become the standard for work of this section.

F. Mock-up may remain as part of the Work.

1.09 DELIVERY, STORAGE, AND HANDLING

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

B. Store restoration cleaner materials in manufacturer's packaging.

C. 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.

1.10 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. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

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

1.11 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

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 CLEANING MATERIALS

A. Cleaning Agent: Detergent type.

B. Acid Solution: Clean, stain free, commercial hydrochloric (muriatic) acid, mixed one part to 10 parts of potable water.

2.03 MASONRY REPAIR MORTAR

A. Conproco Matrix - Repair Mortar as manufactured by Conproco Corporation, 17 Production Drive, Dover, NH 03820; Phone 800-258-3500; website: www.conproco.com.

B. Jahn M70 - Repair Mortar as manufactured by Jahn Restoration Mortars and distributed by Cathedral Stone Products, Inc., 7266 Park Circle Drive, Hanover, MD 21076; Phone (410) 782-9150; website: www.cathedralstone.com.

2.04 MORTAR MATERIALS

A. Comply with requirements of Section 04 0511.

2.05 MASONRY MATERIALS

A. Brick: Section 04 2000.

B. Block: Section 04 2000.

2.06 ACCESSORIES

A. Metal Flashing Materials: Stainless Steel, as specified in Section 04 2000.

B. Lead Joint Covers: Tee Caps: Lead Stone Flashing strips or approved equal from Weathercap.net.
   1. Use size of strips as recommended by sealant manufacturer and compatible with style and configuration of existing.
   2. Strips should be of sufficient size to cover the joint width, plus a percentage allowance for anticipated joint movement, plus 1/4".

C. Sealant: See Section 07 9200 - Joint Sealants. Test to make sure sealant does not stain masonry.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Review the Following U.S. Department of Interior National Parks Service Preservation Briefs prior to beginning work:
   1. Preservation Brief 1 - Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings - https://www.nps.gov/orgs/1739/upload/preservation-brief-01-cleaning-masonry.pdf.
   2. Preservation Brief 2 - Repointing Mortar Joints in Historic Masonry Buildings - https://www.nps.gov/orgs/1739/upload/preservation-brief-02-repointing.pdf.
   3. Preservation Brief 6 - Dangers of Abrasive Cleaning to Historic Buildings - https://www.nps.gov/orgs/1739/upload/preservation-brief-06-abrasive-cleaning.pdf.

3.02 PREPARATION

A. Remove all sealant in contact with masonry on entire exterior of building.

B. Remove all parge coat as indicated and flash in areas of new flashing prior to restoration of masonry.

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

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

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

F. 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.

G. Cover existing landscaping with tarpaulins or similar covers.

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

I. 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.

J. 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.

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

3.03 PREPARATION FOR REPAIR MORTAR

A. Remove all loose mortar and masonry prior to installation of the repair mortar. “Sound” masonry with a hammer to verify its integrity. If necessary, cut away an additional 1/2” of the substrate to ensure the surface to be repaired is solid and stable. Remove any sealant residue.

B. Where cramp anchors, threaded rod anchors, or dowels have been cut and pieces remain embedded in the substrate: Anchors that are free of rust, solidly embedded, and do not project beyond the surface of the masonry unit may remain. All others should be removed.

C. Cut the edges of the repair area to provide a minimum depth of 1/2”. The edges of the repair should be square cut. Do not allow any feathered edges in the repair area.

D. For very dry or porous surfaces, pre-wet the substrate ahead of time to prevent the substrate from drawing moisture out of the repair too quickly. Re-wet the surface immediately before applying the repair material.

3.04 APPLICATION OF REPAIR MORTAR MATERIAL

A. Apply the mortar mix using a trowel to place and compress the mortar into the repair ensuring not to leave any voids. If applied in layers, scrape off any cement skin that has formed and continue application. Dampen the surface and before applying the next layer. Work mortar firmly into the surface of the masonry, including the corners, and under and around all mechanical anchors.

B. Build up repair material so that it is slightly above the adjacent masonry surface. Allow mortar 30 to 60 minutes to set slightly (wait time will vary with temperature and humidity–longer in cool weather), and then scrape off excess material using a straight edge (a plasterer’s miter rod is good for this). Do not press down or “float” the repair. Where repairs occur at panel edges or corners, form mortar to match the profile of the surrounding masonry. In all cases, finish and texture repair so that it is as indistinguishable as possible from the adjacent masonry.

C. Follow specific manufacturer instructions for application and precise color matching.

3.05 FINISHING REPAIR MORTAR TECHNIQUES

A. To obtain a smooth finish repair should be scraped down to the original profile then trowelled to leave a smooth surface. This may cause the repair to lighten and may need to be stained to match.

B. Patching mortar can be textured to match rough surfaces using a variety of finishing tools.

C. Final appearance of patching mortar must match finish of adjacent existing masonry. If it does not patch will need to be removed and reinstalled.

D. Clean any mortar residues from area surrounding the repair by sponging as many times as necessary with clean water. This should be done before repair material sets.

E. Mortar patch must match the color of the adjacent masonry. After the repair has been cured and allowed to dry for at least one week, if the appearance of a repair does not match, the surface color of the repair might be enhanced by applying a vapor permeable, mineral based pigmented stain. If this procedure does not work repair must be removed and reinstalled.

3.06 REPAIR MORTAR CURING PROCEDURES

A. Lightly mist the repair with water to wet the entire surface of the finished repair approximately 24 hours or as recommended by manufacturer for a successful application. Time will vary with temperature and humidity. Protect from direct sunlight, wind, precipitation, and frost. Mist several times a day on the three days following the repair installation or as required by manufacturer. Should access to the repairs be impossible for a period of time, plastic may be used to cover them temporarily. The application of plastic, however, does not remove the need for normal curing techniques. Never cover repairs with plastic immediately after finishing—the water in the repair will be trapped on the surface, causing it to lighten.

3.07 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.

3.08 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 power tools only after test cuts determine no damage to masonry units will result. Do not overcut joints, use hand tools when required - especially on corners, vertical, and "T" locations.

D. Do not damage masonry units. Units damaged will require replacement at Contractor's expense.

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.

3.09 CLEANING EXISTING MASONRY AND CONCRETE

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

3.10 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. Protect area below cleaning operation and keep masonry soaked with water and flushed free of acid and dissolved mortar continuously for duration of cleaning.

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

3.11 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 cleanliness 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.

3.12 LEAD JOINT COVERS

A. Determine the extremes of joint movement using a scribe kit (available from sealant manufacturer); measurement of anticipated and known joint movement is necessary in determining the appropriate size of tee cap to use.
   1. Mark off width of selected tee cap on the masonry/stone surface and apply 1" masking tape lateral to marks.
   2. Pre-fit or shape and cut tee cap strips to closely conform to the profile of the stone substrate as required before setting.
   3. Select width to overlap joint edges not less than 1/8" .
   4. Cut strips to lay in a single full length of each joint wherever possible with an end turn-down over front and back faces of ledges and copings a minimum of 1" or to drop edge.
   5. Make all joints in tee cap neatly mitered, coped, or butted to produce close fitting, weather resisting joint protection; notch strips as recommended by manufacturer.
   6. Apply metal primer to tee cap if required.

B. Sealing and Installing Tee Cap: Install sealants in accordance with manufacturer's recommendations.
   1. If required, install backer rod to a depth of 1/4" below tip of anchor shaft when tee cap is set in place.
   2. Prime stone, if required.
   3. Fill joint with sealant to a height of approximately 1/8" above the adjacent masonry surface. Follow manufacturer's instructions.
   4. Set preformed tee cap strip into the sealant bed, pressed down firmly to the stone surface so bonding grooves are solidly filled and no voids exist between tee cap and masonry.
   5. Clean off excess sealant compound using a putty knife and leave adjacent masonry clean.
   6. Carefully remove masking tape from adjacent surfaces.

3.13 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.

3.14 SCHEDULE

A. Remove all items attached to existing masonry walls typical all locations – interior and exterior. Remove unused through wall items (pipes, bolts, etc.). If item appears to be a utility request assistance prior to removal. Repair and replace all masonry if broken or missing after removal of item, to include mortar joints. Repairs shall be full depth of all masonry walls using repair mortar or pointing mortar depending on location of removed item.

B. Infill all gaps and holes in existing masonry walls full depth with repair mortar or pointing mortar depending on location.

C. Repoint 10% of all Brick Masonry throughout interior and exterior of entire structure unless noted otherwise.

D. Remove and replace all existing sealant on masonry and install new in locations of movement fractures. See Section 07 9200. See Section 01 2200 - Unit Prices.
   1. Add sand to joint sealant to match texture and sheen of nearby mortar when sealant is installed in masonry as a joint.

E. Include 60 linear feet of new movement fracture repair with joint sealant beyond the quantity already identified with keynote A07 on Drawings A201, A202, and A203.

F. Clean all wall brick and stone masonry, and concrete wall surfaces of interior and exterior of building - prior to beginning work and prior to substantial completion. Clean all interior concrete slabs on grade to remain as part of the work - prior to beginning work and prior to substantial completion. Use restoration cleaning methods as specified. Remove all biological and environmental staining. Remove all oils, sealant residue, and paint. Remove all efflorescence on masonry.

G. Remove and replace 100% of the existing wash on top of all brick or stone masonry throughout the interior and exterior of the structure. Provide new wash on all brick masonry that extends beyond the vertical face of the brick masonry course above.

H. Install 26 gauge Stainless Steel through-wall flashing at the base of new masonry walls and at the sills of new windows as shown in Drawings.

I. Remove and replace 100 damaged bricks beyond quantity shown in Drawings (identified in keynote A08 on Drawings A201, A202, A203, and identified by notation on Drawing A210). Clean all mortar from existing brick prior to reconstruction. Replace all broken or cracked brick with new brick masonry to match existing brick masonry bonding, coursing, color, texture, size, and profile. Use solid brick masonry (no cores) on areas where brick face extends beyond face of brick above or below.

J. Remove and replace stone coping cap on west facade according to keynote A09 on Drawings A201 and A210. Include stainless steel flashing, epoxy stainless steel rods, and lead joint covers as described and detailed in Drawings.

K. Remove and replace stone wash or add wash in locations on cornice at west facade according to keynote A11 on Drawings A201 and A210. Install lead joint covers as described and detailed in Drawings.

L. Repair concrete stem wall at locations according to keynote A06 on Drawings A201, A202, and A203. Use Repair Mortar methods described in this Section.

M. Repair movement fracture locations in concrete stem wall and masonry wall with sealant to match color(s) of masonry or concrete and/or mortar. Texture with sand to match existing conditions. Install at locations indicated in keynote A07 on Drawings A201, A202, and A203.

N. Rebuild existing masonry wall to accept new steel lintels and tooth in brick at jambs as described in keynote A04 on Drawing A210.

O. Rebuild the top 6 courses of brick masonry piers (10 locations) on existing brick masonry wall near grid line 7. As indicated in keynote A05 on Drawing A210.

P. Rebuild existing brick masonry wall to create Beam Pockets in masonry as required to accept existing steel beams near west entrance as indicated in Details 4/A210 10/A210.

Q. See Section 01 2200-Unit Prices, for masonry unit price requirements.

R. Rebuild existing top of brick masonry walls to accept Cast Stone wall caps as indicated in Drawing A101 detail 4/A102, Drawing A210 detail 6/A314, and described in Specification Section 04 7200 - Cast Stone Masonry.

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.

C. Section 04 7200 - Cast Stone Masonry: Installation of mortar.

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 Masonry Veneer: Type N.
   2. 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.
      a. Multiple Colors will be needed to match different areas of the building.

G. Water: Clean and potable.

H. Bonding Agent: Epoxy 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.

2.05 PRECONSTRUCTION TESTING

A. Contractor is responsible for testing of existing mortar to determine hardness. New mortar must be softer than existing stone where pointing occurs.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
   1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
   1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete and stone 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 SCHEDULE

A. Repoint 10% of all Brick Masonry throughout interior and exterior of entire structure unless noted otherwise.

B. Provide price per square foot to add or subtract repointing mortar in Brick masonry, see Section 01 2200 - Unit Prices.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block - for multi-wythe construction.

B. Concrete Block - Ground Faced material provided by Owner, section includes materials for and installation only.

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 for Ground Faced units only.

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 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2100 - Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

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

B. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2023.

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

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

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

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

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

H. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.

I. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2024a.

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

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

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

M. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.

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

1.05 ADMINISTRATIVE REQUIREMENTS

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

1.06 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 8 samples of facing brick units to illustrate color, texture, and extremes of color range of each blend required on project.
   1. Minimum 2 blends required, verify with architect.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.07 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.

1.08 MOCK-UPS

A. Construct a masonry wall as a mock-up for each blend color. Panel sized 6 feet long by 3 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-ups may remain as part of work. If rejected mock-up must be removed and reconstructed until approved.

1.09 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: Manufacturer's standard color and texture.

B. Burnished Faced Concrete Masonry Units:
   1. Provided by Owner - see Section 01 1000 - Summary.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Color and texture: Match existing color blend and texture of existing brick on building.
      a. 2 different blends will be required at a minimum.
      b. Fired Face Brick, Appearance Classification Type FBX.

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. Multiple 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.

F. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
4. Vertical adjustment: Not more than 1 1/4 inches.

G. 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.

H. 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.

I. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 3-1/2 inches.

J. Stainless Steel pins for use in epoxy to bond masonry.
1. Size: 3/8-inch diameter rod, length as required to secure masonry.

2.05 FLASHINGS

A. Metal Flashing Materials:
   1. Stainless Steel Flashing: ASTM A666/A666M, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

B. 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.

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

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

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

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

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

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

F. 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.

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

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

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

J. 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: As indicated for different locations.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: As indicated for different locations.
   2. Coursing: Tooth in brick masonry and match existing brick pattern at locations adjacent to existing masonry installation.
   3. Mortar Joints: Concave.
   4. Mortar wash: Provide mortar wash at all joint locations where the face of a masonry course extends beyond the vertical plane of the face of the masonry course above.
      a. Cover the entire exposed horizontal edge of masonry.
      b. Angle: extend from extreme face of lower course, angle up not to exceed the height of the grout joint supporting the stepped back masonry course above.

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 detach 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 - GENERAL AND 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 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 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.11 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties spaced at 16 inches on center.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position. Provide vertical dowels 2'-0" into foundation below. use #5 @ 2'-0" O.C. vertically.

3.12 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:
   1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
   2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer’s directions.
   3. Terminate vertical leg of flashing into bed joint in masonry or reglet in concrete.
   4. Anchor vertical leg of flashing into backing with a termination bar and sealant.
   5. Apply cap bead of sealant on top edge of self-adhered flashing.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

3.13 LINTELS

A. Install steel lintels as indicated in Structural Drawings.

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

C. Bond Beams as detailed in Structural Drawings.

3.14 GROUTED COMPONENTS

A. Lap splices minimum 24 bar diameters.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

C. Place and consolidate grout fill without displacing reinforcing.

3.15 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.

3.16 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, 1/2 inch wide and deep.

D. Install joints at locations as shown on drawings.

3.17 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and window 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.

3.18 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.

3.19 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.

3.20 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

3.21 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.

3.22 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.23 SCHEDULE

A. Install 26-gauge Stainless Steel through-wall flashing at the base of new masonry walls and at the sills of new windows as shown in Drawings.

B. See Drawings for locations shown for repairs and new construction using Brick or Ground Faced CMU. See also Wall Types as indicated in Drawings utilizing CMU and Brick.

C. Field verify color, texture, and size of Brick Masonry blends to match existing. Verify all colors with Architect.

D. Ground Faced CMU to be used at Restroom Groups B and C locations, see Drawings.
   1. Use Ground Faced CMU bond beams at all openings in new CMU construction.

END OF SECTION

SECTION 04 7200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:
   1. Wall units, including wall caps and sills.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting: Mortar for setting cast stone.

B. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

C. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2025.

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

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

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

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

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

J. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2025.

1.04 SUBMITTALS

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

B. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

C. Verification Samples: Pieces of actual cast stone components not less than 12 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
   2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
   1. Any current producer member of the Architectural Precast Association.
   2. Any current producer member of the Cast Stone Institute.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   3. Surface Texture: Fine grained texture, with no bug holes, air voids, or other surface blemishes visible from distance of 20 feet.
   4. Color: Match existing.
   5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.
   1. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Admixtures: ASTM C494/C494M.

E. Water: Potable.

F. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

I. Mortar: Portland cement-lime, as specified in Section 04 0511 ; do not use masonry cement.

J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
1. Drench cast stone components with clear, running water immediately before installation.
2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
1. Rake mortar joints 3/4 inch for pointing.
2. Remove excess mortar from face of stone before pointing joints.
3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
4. Leave the following joints open for sealant:
   a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   b. Joints in projecting units.
   c. Joints between rigidly anchored units, including soffits, panels, and column covers.
   d. Joints below lugged sills and stair treads.
   e. Joints below ledge and relieving angles.
   f. Joints labeled "expansion joint".

B. Installation Tolerances:
1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.

B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.

C. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Keep cast stone components clean as work progresses.

B. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

3.07 SCHEDULE

A. Include Cast Stone wall caps as indicated on Drawing A101 and per detail 4/A102.

B. Include Cast Stone wall caps as indicated on Drawing A210 and per detail 6/A314.

C. Include Cast Stone window sills at Restroom Group C as indicated on Drawing A313 and per detail 8/A002.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL

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; 2025.

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 (Reapproved 2023).

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.
   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.

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 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, "Structural Welding Code - Steel
   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.

B. Fabricate structural steel members in accordance with AISC "ASD Manual of Steel Construction".

C. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

D. Fabricator: Company specializing in performing the work of this section with minimum 10 years of documented experience. A qualified fabricator shall participate in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

E. Erector: Company specializing in performing the work of this section with minimum 10 years of documented experience. A qualified erector shall participate in the AISC Quality Certification Program and is designated an AISC-Certified Erector. Installer must be Certified under the General Erection programs.

F. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Iowa.

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.

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. 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.

G. Finish: See Section 09 9000 - Painting and Coating for finish requirements.

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. Where meeting up with and fitting to existing steel framing not defined by elevations related to 0'-0"; strike bottom of deck lines and measure heights required for various hat framing elements. See details on structural drawings.

C. 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 all structural steel framing, existing and new, 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.

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 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.
   2. Composite Form Deck.

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 STEEL DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
   1. Prime painted Steel Sheet: ASTM A1008/A1008M. Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer’s standard baked on, rust inhibitive primer.
      a. Color: Manufacturer's standard.
   2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 G60 zinc coating.
   3. Deck Profile: Type 3N20.
   4. Profile Depth: 3 inches.
   5. Design Uncoated-Steel Thickness: 20 gage as indicated in drawings.
   6. Span Condition: Triple span.
   7. Side Laps: Overlapped.

B. Steel Composite Form Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
   1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 G60 zinc coating.
   2. Deck Profile: Type 1.5VLI20.
   3. Profile Depth: 1-1/2 inches.
   4. Design Uncoated-Steel Thickness: 20 gage as indicated in drawings.
   5. Span Condition: Triple span.
   6. Side Laps: Overlapped.

2.03 ACCESSORIES

A. Preformed foam closure inserts at flute cells.

B. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. 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 3N20 Deck with wide flute down, see details on structural drawings.

B. 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.

C. Install temporary shoring before placing deck panels if required to meet deflection limitations.

D. Locate deck bundles to prevent overloading of supporting members.

E. 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.

F. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

G. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

H. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

I. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.03 INSTALLATION OF 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.

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 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 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; galvanized, shop prime and paint.

C. Gates: As detailed; hot dipped galvanized, shop prime and powder coat paint.

D. Lavatory Wall Brackets: As detailed; shop prime and paint.

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.

F. General: Comply with NAAMM “Metal Finishes Manual” for recommendations relative to application and designations of finishes. Do not start the finish of metal fabrications until after shop assembly of all components.

G. Surface Preparation
   1. All manufactured panels, gates and equipment shall be shot blasted so that all rust and debris is removed from the metal surfaces. The blasting shall leave an etched surface to promote the bond of the finishes.
   2. Dust and oils shall be removed from steel by means of an aqueous paint pretreatment wash system or similar. This system shall also apply a phosphate conversion coating with a minimum coating weight of 60 mg per square meter. Pretreatment system must have integrated rinse stage(s) between stages and final rinse.
   3. Moisture from the rinse cycle shall be immediately dried by forced heat.
   4. Hot Dip Galvanize All Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.04 FASTENERS AND ANCHORAGE SYSTEMS

A. Fastening and anchorage shall be provided to support applied loads of the equipment designed.

B. Provide blocking and wall support for all items in this Section unless noted otherwise.

2.05 FABRICATION, GENERAL

A. Use materials of size and required thickness to produce strength and durability in finished product. Work to dimensions shown using proven details of fabrication and support.

B. Form exposed work true to line and level with accurate angles and surfaces. Ease exposed edges to a radius of approximately 1/8” unless otherwise noted.

C. Weld corners and seams continuously, mitered or butt joints are acceptable, complying with AWS recommendations. Any open ends shall be welded closed with a minimum of 16-gauge materials on flat plates and 14-gauge on gate equipment. At exposed connections, welds shall be free from any snags or pits, remove any sharp or rough areas by grinding smooth. Grind any exposed welds that protrude more than 1/8” from the surface.

D. Fabricate items with joints neatly fitted and properly secured.

E. Preassemble items in shop to greatest extent possible to minimize assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinate installation.

F. Match sizes and dimensions as indicated on Drawings.

2.06 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.

B. Verify all dimensions related to installation of stall systems. Incorporate verified dimensions in Shop Drawings.

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.

3.05 SCHEDULE

A. Include all non structural metal items that are part of project, to include the following:
   1. Lintels as indicated in Drawings.
   2. Lavatory Wall Brackets as indicated in Drawings.
   3. Gates at entries along south facade of building, Type D, as indicated in Drawing A002.
   4. Bollards as required for Gate installation.

5. Gates at mezzanines, Type C as indicated on Door & Frame Schedule, and on Drawings A002 and A312.
6. Stainless Steel posts at wash basins as indicated in Drawings.
7. Other items shown in Drawings.

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. Fire retardant treated wood materials.

E. Miscellaneous framing and sheathing.

F. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 06 1500 - Wood Decking.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

A. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

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.

G. 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 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.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

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. Species: Spruce-Pine-Fir (South), unless otherwise indicated.

2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER

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. Fire Retardant Plywood: Wood structural panels.
1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84 or UL 723.
2. Plywood Panels:
a. Thickness: 5/8-inch and 3/4-inch as noted.
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 WOOD DECKING

A. Lumber Decking: Fabricated to AITC 117.
1. Species: Southern Yellow Pine, #1 Grade SYP.
2. Size: 1 by 6 inches, nominal.
3. Pattern: Shiplap or Pattern 105 with a 3/8-inch lap.
4. Moisture Content: 18% or less. Kiln-Dried After Treatment to minimize shrinkage, warping, and cupping once installed.

2.05 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: 305/316 Stainless steel 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. Nails, Brads, and Staples: ICC AC116 and ICC AC201.
4. Power-Driven Fasteners: ICC-ES-1539 or NER-272.

B. Sill Flashing: See Section 07 6200.

C. General Purpose Construction Adhesives: Comply with ASTM C557.

2.06 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. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. 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 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges use sheathing clips where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.

3.07 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.08 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.

3.09 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.10 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.

3.11 SCHEDULE

A. Remove all loose paint from wood surfaces – scrape, clean, prime, and repaint all wood surfaces as specified in Section 09 9000 - Painting and Coating.

B. Remove and replace all sealant on wood surfaces at entire exterior and within entire interior of building as specified in Section 07 9200 - Joint Sealants.

C. Replace or sister deteriorated Roof Rafters and Rafter Tails at locations as indicated on Drawings. See also Section 01 2200 - Unit Prices.
    1. Roof Rafter sister or replacement shall be both sides and full length to bear on purlins at each end.
    2. Rafter Tail sister or replacement shall be both sides and full length of overhang to extend two purlins inside of structure.
        a. Replace or sister 75 rafter tails around entire perimeter of upper roof (Roof Area C) prior to installation of new fascia. Verify locations with Architect.

D. Roof Areas A1, & A4-A6 and portions of A7 & A11 – Remove wood fascia. Replace with new fascia as detailed in Drawings.

E. Roof Areas C and portions of A7, A8, A10 and A11 – Remove wood fascia and cut back decking to accept new roof Nailer. Replace with new Nailer, fascia, plywood as detailed in Drawings.

F. Roof Areas A7, A8, A9, A10, and A11 – Cut back wood decking to accept new roof Nailer. Replace with new Nailer, plywood as detailed in Drawings.

G. Remove and replace deteriorated wood deck boards, cut boards to bear on a roof rafter at each end to avoid a weak location on roof. Locations and size as indicated in Drawings. See also Section 01 2200 - Unit Prices.
    1. Replace 1500 square feet of deteriorated wood deck boards on roofs beyond the quantity identified on the Drawings.

H. Replace 2x8 and 2x6 fascia around entire perimeter of building at low roof edge as indicated on Drawings. Cut existing and new rafter tails to plumb fascia to align straight and true. Coordinate with contract 071 to complete all work prior to installation of Prefinished metal.

I. Replace 2x6 Wood Nailers as indicated in Drawings. See also Section 01 2200 - Unit Prices.

J. Provide solid wood blocking in walls to support shelving in Office rooms as indicated in Drawings.

K. Provide MDO Plywood head, jamb, and sill trim on new windows in existing masonry wall as indicated on Drawings A210 and Detail 9/A002.

END OF SECTION

SECTION 06 1800
GLUED-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glue laminated wood beams.

1.02 REFERENCE STANDARDS

A. ANSI A190.1 - Product Standard for Structural Glued Laminated Timber; 2022.

1.03 SUBMITTALS

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

B. Product Data: Provide technical data on wood treatment.

C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads, bearing and anchor details, bridging and bracing, framed openings .

1.04 QUALITY ASSURANCE

A. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with three years of documented experience, and certified by AITC in accordance with ANSI A190.1.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect members to AITC requirements for not wrapped.

B. Leave individual wrapping in place until finishing occurs.

PART 2 PRODUCTS

2.01 GLUED-LAMINATED UNITS

A. General: Provide structural glued-laminated timber that complies with ANSI 117 or research/evaluation reports acceptable to authorities having jurisdiction.
   1. Provide structural glued-laminated timber made from single species.
   2. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
   3. Provide structural glued-laminated timber made with wet-use adhesive complying with ANSI A190.1.
   4. Adhesive shall not contain urea-formaldehyde resins.
   5. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Certified Wood: Glulams shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

C. Species and Grades for Structural Glued-Laminated Timber: in grades indicated on drawings.

D. Species and Grades for Beams:
   1. Species and Beam Stress Classification: Douglas fir-larch
   2. Lay-up: Balanced.
   3. Species and Combination Symbol:
      a. 16F-V6 at GB2 5 1/2” x 24” beams.

E. Provide all Glue-Laminated Beams with NO CAMBER.

F. Appearance Grade: Architectural, complying with ANSI 110.
   1. For Architectural appearance grades, fill voids as required by ANSI 110.

G. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

H. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

I. Sealers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

J. Ship and Deliver Glue-Laminated Beams in full protective wrap and maintain until installation. Provide dunnage to protect and preserve on site.

2.02 TIMBER CONNECTORS

A. As shown on Structural Drawings.

2.03 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
   1. Dress exposed surfaces as needed to remove planing and surfacing marks.

B. Camber: No Camber.

C. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

2.04 FACTORY FINISHING

A. Clear Finish: Manufacturer's standard, two-coat, clear varnish finish; resistant to mildew and fungus.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of structural glued-laminated timber.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb, and with uniform, close- fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
   1. Lift with padded slings and protect corners with wood blocking.
   2. Install structural glued-laminated timber to comply with Shop Drawings.
   3. Install timber connectors as indicated.

B. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.
   1. Predrill for fasteners using timber connectors as templates.
   2. Dress exposed surfaces as needed to remove planing and surfacing marks.
   3. Coat crosscuts with end sealer.

C. Cutting: Avoid cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

3.03 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.04 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose including protection from weather, sunlight, soiling, and damage from work of other trades.
   1. Coordinate wrapping removal with finishing work specified in Division 09. Retain wrapping where it can serve as a painting shield.
   2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION

SECTION 06 6000
CELLULAR PVC FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cellular PVC Fabrications of the following types:
   1. Window Trim.
   2. Shower Trim.

1.02 REFERENCE STANDARDS

A. 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).

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

C. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

D. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position; 2018.

E. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and +30°C with a Vitreous Silica Dilatometer; 2024.

F. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.

G. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 2020.

1.03 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 07 90 00 - Joint Protection.

1.04 REFERENCES

A. ASTM International (ASTM):
   1. ASTM B429 - Standard Specification for Aluminum Alloy Extruded Structural Pipe and Tube.
   2. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
   3. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
   4. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.
   5. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
   6. ASTM D696 - Test Method for Coefficient of Linear Expansion of Plastics.
   7. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
   8. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

B. American Association of Textile Chemists and Colorists (AATCC):
   1. AATCC 127 - Water Resistance: Hydrostatic Pressure Test.

C. American Wood Protection Association (AWPA):
   1. AWPA E12 - Standard Method of Determining Corrosion of Metal in Contact with Treated Wood.

D. International Code Council (ICC):
   1. ICC AC227 - Rigid Cellular PVC Non-Load Bearing Exterior Trim.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Verification Samples: Two representative units of each type, size, pattern and color.

D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.07 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.09 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty.
   1. Warranty Duration, Trim:
      a. Non-residential: Twenty-five (25) years.

PART 2 PRODUCTS

2.01 CELLULAR PVC TRIM

A. PVC: Free Foam Cellular PVC material with a small-cell microstructure and density of .55 grams/cm3.

B. Performance Requirements:
   1. Density (ASTM D792): 0.022 lbs per cu inch (0.60 g per cu cm).
   2. Water Absorption, 24 hours (ASTM D570): Less than 0.3 percent.
   3. Water Resistance (ASTM D570 and AATCC 127): No penetration, passes ICC AC227.
   4. Surface Burning (ASTM E84): Flame spread index of 25.
   5. Burning Rate (ASTM D635): No burn when flame removed.
   6. Gardener Impact Resistance (ASTM D5420): 629 inch-lbf (71.1 Nm) for 3/4 inch thick trim.
   7. Coefficient of Linear Thermal Expansion (ASTM D 696): .000035 inch/inch/degree F (0 inch/mm/C).
   8. Strength (ASTM D790):

a. MOR (Flexural Strength): 3,600.0 psi.
b. MOR (Flexural Modulus): 144,000.0 psi.

9. Weathering (ASTM G155 and ASTM D790):
   a. MOR Change: Plus 2.4 percent, Pass ICC AC 227.
   b. MOE Change: Plus 0.7 percent.
10. Weathering (ASTM D6662 and ASTM D790):
   a. MOR Change: Plus 0.1 percent, Pass ICC AC 227.
   b. MOE Change: Plus 0.9 percent.
11. Termite Resistance (ASTM D3345): 9.2, Pass ICC AC 227.
12. Negative Transverse Wind Load (ASTM E330): 72 psf 1 psi.
13. Heat Deflection Temperature (ASTM D648): 146 degrees Fahrenheit at 264 psi.
14. Corrosion by Preservative Treated Wood (AWAP E12): No weight loss, Pass ICC AC 227.
15. Izod Impact, Notched (ASTM D648): 0.37 ft-lb/in (0.02 N-m/mm).
16. Heat Conductivity (ASTM C177): 0.50 btu-in/hr-ft2-degrees F (0.00072 W/cm C).

C. PVC Trim
1. Material: Solid cellular PVC.
2. Finish: Smooth.
3. Allowable Tolerances:
   a. Variation in component length: Minus 0.00 and plus 7/8 inch.
   b. Variation in component Width: Minus 0.00 and plus 1/16 inch.
   c. Variation in component thickness: Plus or minus 5 percent.
   d. Variation in component edge: Plus or minus 2 degrees.
   e. Density range: 0.58 - 0.62.
   f. Shore-D hardness: 45.
4. Color: To be selected by Architect.

D. Accessory Materials
1. Fasteners: Stainless steel or hot-dipped galvanized steel, 6 penny nails.
   a. Long enough to penetrate through substrate a minimum of 3/4 inch.
   b. Do not use brads, staples, wire nails, or fine-threaded wood screws.
2. Adhesives: Extreme Adhesives or as recommended by trim manufacturer.
3. Sealants: Fill n Flex or as recommended by trim manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.

B. Verify that substrate and adjacent materials are dry and ready to receive vapor retarder.

C. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

B. Cutting: Use saw capable of miter cuts with a fine-toothed carbide tipped finish trim blade with tooth count as recommended by manufacturer.

C. Follow manufacturer's recommendations for fastener placement and spacing.

D. Trim:

1. Install a 1/4 inch bead of adhesive on each joist to minimize expansion and contraction.
2. Cut final boards as required and install as soon as possible after cutting.
3. Expansion and Contraction: Refer to manufacturers board spacing chart based on temperature at the time of installation.
4. Glue all joints between trim pieces to prevent joint separation.
5. Install end butts and miters tight.

3.04 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

3.05 CLEANING AND PROTECTION

A. Clean products in accordance with the manufacturer's recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 SCHEDULE

A. Install 3-inch wide PVC trim around the interior of all windows - jambs, head, and sill.

B. Install 3-inch wide PVC casing above preformed shower units - 3 sides typical - to bridge top of shower to CMU transition.

C. Install 3-inch wide PVC casing along jambs full height of shower unit - to bridge transition of preformed shower unit and CMU.

D. Install 3-inch wide PVC sill at threshold of preformed shower unit - to bridge transition of preformed shower unit and concrete floor.

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 as indicated in Room Finish Schedule.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall and underside of floor slabs.

B. Batt insulation in exterior wall construction.

C. Batt insulation for filling perimeter window and door shim spaces.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

1.03 DEFINITIONS

A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.
   1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also considered a mineral.
   2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
   3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

1.04 REFERENCE STANDARDS

A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.

B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

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 C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2024.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.05 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. Shop Drawings: Submit drawings that indicate location of joint or termination detail conditions.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   4. Board Edges: Square.
   5. Products:
      a. Owens Corning Corporation; FOAMULAR NGX Type 250 Next Generation Extruded: www.owenscorning.com/en-us/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Thickness: 6 inch.
   4. Products:
      a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
      b. Nu-Wool; ECOCELL: https://nuwool.com.
      c. ROCKWOOL; COMFORTBATT: www.rockwool.com.
      d. ROCKWOOL; AFB: www.rockwool.com.
      e. ROCKWOOL; AFB evo™: www.rockwool.com.
      f. Thermafiber, Inc; SAFB: www.thermafiber.com.
      g. Thermafiber, Inc; SAFB FF: www.thermafiber.com.
      h. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.

B. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with modified butyl adhesive, polyester fiber top sheet, and polypropylene interlayer.
   1. Application: Primerless adhesion for use as through-wall flashings and wall transitions to roof and below-grade systems.
   2. Thickness: 45 mil, 0.045 inch, nominal.
   3. Size: 6 inches wide, in rolls 75 feet long.

C. Flashing Tape: Special reinforced film with high performance adhesive.
   1. Application: Window and door opening flashing tape.
   2. Width: As required for application.

D. Insulation Fasteners: Lengths of unfinished, 13-gauge, 0.072-inch high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

E. Adhesive: Gun grade, interior and exterior, and compatible with insulation and substrates; complies with ASTM C557.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
   1. Apply adhesive in five continuous beads per board length.
   2. Install boards horizontally from base of foundation to top of insulation.
   3. Butt boards tightly, with joints staggered from insulation joints.

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.04 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Retain insulation batts in place with wire mesh secured to framing members.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.06 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

3.07 SCHEDULE

A. Locate rigid insulation under slab and on around perimeter foundations of Restroom Groups B and C as indicated in Drawings.

B. Locate batt insulation in Wall Type W3 locations as indicated in Drawings.

SECTION 07 5400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with thermoplastic roofing membrane.

B. Insulation, tapered.

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 C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

B. ASTM D4263 - Standard Practice for Indicating Moisture in Concrete by the Plastic Sheet Method; 2024.

C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

E. FM (AG) - FM Approval Guide; Current Edition.

F. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2025).

G. NRCA (RM) - The NRCA Roofing Manual; 2025.

H. 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 thickness required for construction of built-up crickets.

C. Acceptable Insulation Types - Tapered Application: Any of types specified.
1. Tapered polyisocyanurate board.
2. Tapered polyisocyanurate board covered with uniform thickness cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
3. Uniform thickness polyisocyanurate or cellular glass board covered with tapered polyisocyanurate, extruded polystyrene, or perlite 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. Flexible Flashing Material: Same material as membrane.

D. 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.

E. 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: Faced, and with high compressive strength polyisocyanurate (ISO) insulation complying with ASTM C1289, and the following characteristics:
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 2 - faced with coated glass-fiber-mat facers on both major surfaces of core foam
2) Compressive Strength: Grade 1, 109 psi.
3) Thickness: 1/2 inch.

2. Board Size: 48 by 48 inches.
3. Products:
   a. Johns Manville; SeparatoR CGF: www.jm.com/#sle.
   b. 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 Thickness: 2.0 inches.
   3. Tapered Board: Slope as indicated; minimum thickness 1 inch; fabricate of fewest layers possible.
   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. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

B. T-Joint Patch: Flexible, non-reinforced TPO - to seal seam laps where perimeter and/or header sheets intersect.

C. Cover Tape: 30mil minimum thick, non-reinforced TPO membrane with factory applied peel and stick adhesive tape - to strip in metal flanges..

D. Universal Corners: Flexible, non-reinforced TPO - designed in a waffle pattern for easy installation around inside and outside corners.

E. Single Ply Sealing Mastic: to seal single ply membranes to terminations and other penetrations.

F. Edge Sealant: to seal cut edges of TPO membrane.

G. Sheathing Adhesive: Noncombustible type, for adhering gypsum sheathing to metal deck.

H. Sheathing Joint Tape: Paper type, 4 inches wide, self adhering.

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 PREPARATION - WOOD DECK

A. Verify flatness and tightness of joints in wood decking; fill knot holes with latex filler.

3.03 PREPARATION - CONCRETE DECK

A. Fill surface honeycomb and variations with latex filler.

B. Do not begin work until elevated concrete substrate has cured at least 28 days and moisture content is five percent or less.
   1. Test as Follows:
      a. Concrete Moisture Content: No beading water under plastic after 16 hours when tested in accordance with ASTM D4263.
      b. Relative Humidity in Concrete: Not greater than 75 percent when tested in accordance with ASTM F2170.

3.04 PREPARATION - METAL DECK

A. Install deck sheathing on metal deck:
   1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
   2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
   3. Tape joints.
   4. Fasten sheathing to roof deck with continuous mopping of adhesive on each flute.

3.05 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.

3.06 INSTALLATION - COVER BOARD 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. Attachment of Cover Board and Insulation: Embed each layer of insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions.

C. Cover Boards: Apply cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

F. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

G. Do not install more cover board or insulation than can be covered with membrane in same day.

3.07 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.

H. Fully adhere a 4'-0" x 4'-0" second membrane layer under spouts of downspouts on upper roofs that drain on to roof below.

3.08 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.

3.09 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.

3.10 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

3.11 SCHEDULE

A. Install new membrane and coverboard at all roof locations on entire building. See Drawings for Roof Types, Details, and Locations.

B. Install tapered insulation at Glulam Beam location as shown in Drawings on Roof Areas A7, A8, A9, A10, and A11.

C. Install Cricket at Roof Hatch in Restroom Group B.
   1. Install 2nd layer of membrane around roof hatch exit as shown on Drawings.

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 minimum thick base metal unless noted different based on use.

B. Stainless Steel Flashing: ASTM A666/A666M, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

2.02 PREPAINTED, METALLIC-COATED STEEL SHEETS

A. Description: Factory-applied coatings applied to metallic-coated steel sheet substrates prior to fabrication by coil coating; topcoat systems consist of primers and organic topcoats on exposed, top side of sheet; washcoats on bottom, unexposed sheet side.

B. Comply with ASTM A755/A755M.

C. 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.

D. Substrate Preparation for Prefinishing: Clean and prepare substrate surfaces in accordance with coating manufacturer's recommendations for substrate type and application.

E. Washcoats or Backercoats: Provide washcoats or backercoats in accordance with organic coating manufacturer's recommendations.

F. Primer Coats: Provide basecoat primers in accordance with coating manufacturer's recommendations for substrate type, topcoat, and application.

G. 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.

H. Color: White 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: Ogee Square profile .

B. Downspouts: Hexagon profile Open Faced. Sized to fit Gutters.

C. Gutters and Downspouts: Size indicated on drawings.
1. Gutters: 7-inch and 8-inch as indicated.
2. Downspouts: 5-inch and 6-inch as indicated.

D. Accessories: Profiled to suit gutters and downspouts.
1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
2. Gutter Supports: Brackets.
3. Downspout Supports: Brackets.

E. 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 METAL WALL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
1. Provide exterior wall panels, interior liner panels, soffit panels, retrofit wall panels, and subgirt framing assembly.
2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.

3. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.
4. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
8. Corners: Factory-fabricated bent in one continuous piece return as indicated in Drawings.

B. Exterior Wall Panels:
1. Profile: Flat no ribs; style as indicated on Drawings to match existing.
2. Termination Seams: Double-interlocked, tight-fitting, sealed.
3. Material: Precoated steel sheet, 18 gauge, 0.0478 inch minimum thickness.
4. Panel Width: Full width of installation with no seams.
5. Color: As selected by Architect from manufacturer's standard line.

C. Soffit Panels:
1. Profile: Style as indicated, with venting provided.
2. Material: Precoated steel sheet, 20 gauge, 0.032 inch minimum thickness.
3. Color: As selected by Architect from manufacturer's standard line.

2.07 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 Miscellaneous 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.

I. Set spouts of downspouts from upper roofs that drain on to roof below 8 inches above roof surface.

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. Through-Wall Flashing for Windows and Masonry, locations as specified and as shown on Drawings.
   1. Stainless Steel.

B. Expansion Joint Covers, as shown on Drawings.
   1. Stainless Steel.

C. Counterflashing, Coping, Fascia, Trim, Gutter, and Downspout Systems, locations as required, specified and/or as shown on Drawings.
   1. Prefinished Metal.

D. Soffit Panels as specified and indicated on Drawings in Drinking Fountain alcoves in Restroom Groups B and C and Detail 7/A314.

E. Soffit Panels as specified and indicated on Drawings in Room Entry 20 in Restroom Group B.

F. Exterior Wall Panels as specified on exterior walls of Arena Clerestory, See Drawings Detail 3/A131.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof hatches.

B. Roof hatches with access ladders.

1.02 REFERENCE STANDARDS

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

1.03 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for entire assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 ROOF HATCHES

A. Roof Hatch Manufacturers:
   1. Precision Ladders, LLC; Model PH-G 36" x 36": www.precisionladders.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Hatches with Folding Ladder Manufacturers:
   1. Precision Ladders, LLC; Super Simplex Attic Stairs: www.precisionladders.com.
      a. Opening Size: Inside Box Size 2'-6" wide x 6'-10-1/8" long - 63 Degree Slope, Angle Frame Box with 5-inch top flange and 1-inch lower flange.
         1) Height: Floor to Floor 11'-4".
         2) Box Height: 12 inches.
         3) Include stairway, custom frame to fit distance from ceiling to roof and a custom roof hatch factory-mounted to the top of the frame. Match requirements outlined in this specification for Roof Hatches sized to fit opening.
   2. Substitutions: See Section01 6000-Product Requirements.

C. Performance

1. Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m²) with a maximum deflection of .67% of the span and a 20 psf (97 kg/m²) wind uplift for galvanized steel (Model PH-G) and aluminum (Model PH-A) roof hatches.
2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
3. Operation of the cover shall not be affected by temperature.
4. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.

D. Curb
1. Formed from 14 gauge galvanized steel of lock forming quality per ASTM A-525 with G90 coating (.090 Aluminum H-14 3003 on aluminum models).
2. Sheathed with 1" of rigid fiber board insulation.
3. Height of 12" unless indicated otherwise on drawings.
4. 4" integral flange for securing to roof.
5. Hinges connecting curb to door shall be 1/8", 2 piece formed steel with 3/8" pivot pin.
6. Extruded rubber gasket within a 20 gauge extruded aluminum track shall be securely attached to the frame to make the unit weathertight.

E. Hatch Cover
1. Formed from 14 gauge galvanized steel of lock forming quality per ASTM A-525 with G90 coating (.090 Aluminum H-14 3003 on aluminum models).
2. Liner shall be 22 gauge galvanized steel with G90 coating (.040 Aluminum H-14 3003 on aluminum models).
3. Insulation between cover and liner to be 1" thick U.L. plain fiberglass 0.75# density.
4. Lid shall be reinforced as required with 11 ga. steel channel (.090 Aluminum H-14 3003 on aluminum models).
5. A one point cab lock is to be provided with a built-in inside handle on units with a length of 4' 6" or less. On units of greater length, a 2 point slam lock will be used.
6. Exterior of cover shall be devoid of hardware with the exception of the outside handle.
7. Outside handle shall be vinyl coated, steel T-handle.
8. Automatic hold-open device shall be formed from 3/16" steel flat bar and 1/2" diameter steel round stock with a vinyl grip.
9. Padlock provisions provided on both interior and exterior of unit.
10. Extruded rubber gasket shall be securely attached to the liner, thus providing a weather-tight seal.

F. Pressure Control
1. Opening/closing assistance/resistance shall be provided with spring-loaded pressure intensifiers consisting of a telescoping tube; the top(outer) tube shall be 1 5/16",bottom (inner) tube shall be 1 1/2". Tubes shall be cadmium plated and chromate-sealed.

G. Accessories
1. Precision Safety Access Handrail, mounted to outside corner of hatch curb, to provide a fixed hand hold assist when entering or exiting the hatch.
2. Precision Extend-A-Rail, to be mounted to hatch access ladder, to provide a retractable hand hold assist when entering or exiting the hatch.
3. Precision Aluminum Guard Rail System with self-closing gate, mounted to exterior of hatch, to protect the roof opening.

H. Fabrication
1. The hatch is completely fabricated ready for installation before shipment to the site.

I. Finish
1. Red oxide primer OR Mill finish aluminum

J. Source Quality Control
1. All products tested in factory for proper operation before shipment.

2.02 FIXED WALL LADDERS

A. Wall Ladder Manufacturers:
   1. Precision Ladders, LLC; Super Simplex Attic Stairs]: www.precisionladders.com.
   2. Substitutions: See Section 01 6000-Product Requirements.

B. Aluminum Fixed Vertical Ladder and Components
   1. Ladder, fall arrest system, walk-thru, side rails, cage, rest platforms, floor mounting brackets, security doors, security gates and finishes.
   2. Model: Model FL -14'-7" Aluminum Fixed Vertical Ladder as manufactured by Precision Ladders LLC.
   3. Capacity: Unit shall support a 1,500 lb (680 kg) loading without failure.
   4. Performance Standard: Units designed and manufactured to meet or exceed ANSI A14.3, OSHA 1910.23, OSHA 1910.28 and OSHA 1910.29.

C. Components:
   1. Ladder Stringer: 2-1/2 inch by 1-1/16 inch by 1/8 inch (64 mm by 27 mm by 3 mm) extruded 6005-T5 aluminum channel. Pitch: 90 degrees.
   2. Ladder Tread: 2-1/4 inch by 3/4 inch by 1/4 inch (57 mm by 19 mm by 6 mm) extruded 6005-T5 aluminum with deeply serrated top surface.
   3. Ladder Mounting Bracket: 8-1/2 inch by 2 inch by 3 inch by 1/4 inch thick (216 mm by 51 mm by 76 mm by 6 mm) aluminum angle.

D. Finishes:

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage and replace components prior to installation.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with approved submittals.

B. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

3.06 SCHEDULE

A. Install Roof Hatch with Fixed Wall Ladder as specified on mezzanine at Restroom Group B and as shown in the Drawings and on A121, A130, A131, A312, and A315.

B. Install Roof Hatches with Folding Ladder as specified in Room Mech 24 in Restroom Group B, and in Room Chase 32 Restroom Group C, and as shown in Drawings and on A102, A311, A312, and A315.

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 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 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).

1.04 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.

1.05 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.

1.06 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 masonry and different exposed materials.
      4) Openings below ledge angles in masonry.
      5) Required soft joints in masonry.
2. Interior Joints:
   a. Do not seal intended gaps and openings in gypsum board and suspended ceilings
   b. Seal open joints except specific open joints indicated on drawings as not sealed.
   c. 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.

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.

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.
   a. Multiple colors will be required depending on location and material.
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.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

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.

3.05 SCHEDULE

A. Remove and replace all sealant on masonry, steel, and wood surfaces along entire exterior and within entire interior of building.

B. Remove caulking between steel lintels and masonry on all applicable windows, exterior openings, and exterior surfaces. Do not touch windows on west facade that were part of previous project.

C. Remove and replace all sealant in masonry and window assemblies and all sealant found in contact with masonry and window assemblies. Replace with sealant as specified for each specific application. Do not touch windows on west facade that were part of previous project.

D. Place sealant in all voids and cracks on existing and interior walls, and roof. Place sealant at all intersections of existing and new materials to form an airtight and water tight assembly as indicated.

E. Sealants for Membrane Roofing as recommended by roofing manufacturer in Section 07 5400.

F. Install sealant in all joints of new concrete and paving.

G. Install sealant in all movement joints of masonry and concrete. Apply sand to sealant joint to match sheen and texture of nearby mortar and/or concrete.

H. Unless noted otherwise. Remove and replace or Install new sealant at all locations where dissimilar materials meet on the interior and exterior of structure.

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. Section 08 7100 - Door Hardware.

B. See Hardware Schedule on Drawings.

C. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

D. Section 09 9000-Painting and Coating.

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. Door Edge Profile: Beveled, both sides.
   4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
   5. 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.
   6. 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. 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: Polyurethane, 1.8 lbs/cu ft minimum density.
      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 Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
   4. Door Thickness: 1-3/4 inches, nominal.
   5. Top Closures: Closure reinforcement Channel 14 Gage, Flush with top of faces and edges. Fully welded.
   6. Lock and Hinge preparation as required for
   7. Door Face Sheets: Flush.
   8. Weatherstripping: Refer to Section 08 7100.
   9. Door Finish: Factory primed and field finished.

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: Full profile/continuously welded 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.

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.

B. Refer to Section 08 7100 Door hardware for hardware requirements.

END OF SECTION

SECTION 08 5200
CLAD WOOD WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory-fabricated aluminum clad wood windows.

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 Fixed-Frame Windows: Pella factory-assembled, aluminum-clad wood, fixed-frame windows.
   1. Frame:
      a. Select woods, 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.
      b. Interior Exposed Surfaces: Painted Pine with no visible fastener holes.
      c. Exterior Surfaces: Clad with aluminum.
      d. Assembled with screws.
      e. Overall Frame Depth: 5 inches (127 mm).

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. Provide with obscure (or frosted) on Surface 2 in insulated units.
   5. 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. Fixed non-operable.
   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. 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.

E. Fasteners: Stainless steel.

F. Sealant and Backing Materials: See Section 07 9200 of types as indicated.

G. Flashing: Provide related flashings, with necessary anchors and attachment devices.

2.04 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.

B. Verify rough opening prior to ordering.

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.

3.06 SCHEDULE

A. Install windows in Details 6, 7, 8, 9, and 11 on Drawing A002, shown in Plans on Drawing A102, and in Details 1/A210, 3/A310, 2/A313, and 3/A313.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for flush wood and steel doors.

B. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

1. Section 08 1113 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

A. BHMA A156.1 - Standard for Butts and Hinges; 2025.

B. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

C. BHMA A156.4 - Door Closers and Pivots; 2024.

D. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2022.

E. BHMA A156.16 - Standard for Auxiliary Hardware; 2023.

F. BHMA A156.18 - Standard for Materials and Finishes; 2020.

G. BHMA A156.22 - Standard for Gasketing; 2021.

H. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

I. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

J. UL (DIR)- Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.

1. List groups and suffixes in proper sequence.
2. Provide complete description for each door listed.

1.05 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 the type specified for commercial door hardware with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.

1. Closers: 25 years, minimum.
2. Exit Devices: 3 years, minimum.
3. Locksets and Cylinders: 3 years, minimum.

4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.

2.02 HINGES

A. Manufacturers:
   1. IVES; an Allegion brand; Heavy Weight stainless steel base: www.allegion.com
   2. Hager: Hager Companies; www.hagerco.com
   3. Substitutions: See Section 01 6000 - Product Requirements.
   4. Hinges: Complying with BHMA A156.1, Grade 1.
      a. Provide hinges on every swinging door.
      b. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
      c. Provide non-removable pins on exterior out swinging doors.
      d. Provide following quantity of butt hinges for each door:

2.03 LOCK CYLINDERS

A. Manufacturers:
   1. FALCON, an Allegion brand; https://us.allegion.com
   2. “E” Keyway.
   3. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
      a. Provide cylinders from same manufacturer as locking device.
      b. Provide cams and/or tailpieces as required for locking devices.

2.04 MORTISE LOCKS

A. Manufacturers:
   1. SCHLAGE, an Allegion brand; L-series: https://us.allegion.com
   2. 06 lever / A rose.
   3. Mortise Locks: Complying with BHMA A156.13, Grade 1, Security, 1000 Series.
      a. Latchbolt Throw: 3/4 inch, minimum.
      b. Deadbolt Throw: 1 inch, minimum.
      c. Backset: 2-3/4 inch unless otherwise indicated.
      d. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
         1) Finish: To match lock or latch.

2.05 CLOSERS

A. Manufacturers; Surface Mounted:
   1. LCN, an Allegion brand; 4050 series: https://us.allegion.com
   2. Norton; an Assa Abloy Group company; 7500 Series: www.assaabloydss.com.
   3. Closers: Complying with BHMA A156.4, Grade 1.
      a. Type: Surface mounted to door.

2.06 WALL STOPS

A. Manufacturers:
   1. IVES, an Allegion brand: https://us.allegion.com
   2. Rockwood; an Assa Abloy Group company; 405: www.assaabloydss.com/#sle.

3. Wall Stops: Complying with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
    a. Provide wall stops to prevent damage to wall surface upon opening door.
    b. Type: Bumper, concave, wall stop.
    c. Material: Aluminum housing with rubber insert.

2.07 THRESHOLDS

A. Manufacturers:
    1. ZERO, an Allegion brand: https://us.allegion.com
    2. Pemko; an Assa Abloy Group company; Saddle Threshold 176: www.assaabloydss.com.

2.08 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
    1. ZERO, an Allegion brand: Perimeter Gasketing 328AA, Door Sweep 39A.
    2. Weatherstripping and Gasketing: Complying with BHMA A156.22.
    3. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated;

2.09 SILENCERS

A. Manufacturers:
    1. Rockwood; an Assa Abloy Group company; 608-RKW: www.assaabloydss.com.
    2. Substitutions: See Section 01 6000 - Product Requirements.
    3. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
        a. Single Door: Provide three on strike jamb of frame.
        b. Material: Rubber, gray color.

2.10 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
    1. Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.
    2. Exceptions:
        a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
        b. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
    1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.

D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.07 HARDWARE SCHEDULE - BEGINS ON NEXT PAGE

END OF SECTION

SECTION 08 7110
HARDWARE SCHEDULE

SCHEDULE

HEADING #:01

1 SGL Door: 33, 37

3' 0" x 7' 2" x 1 3/4" HMD/HMF

4 EA	Hinge, Full Mortise, Hvy Wt	5BB1HW 4-1/2" x 4-1/2"	625 (HI-1) Ives
1 EA	Entry Lock	PBR 8807FL LC	625 (LO-7) ASSA ABLOY ACCENTRA
1 EA	Housing	C987	.626 (CY-1) Falcon
1 EA	Interchangeable Core	C606 .E	.625 (CY-2) Falcon
1 EA	Overhead Stop	905S	630 (OH-3) Glynn-Johnson
1 EA	Surface Closer	4040XP .RWPA	.689 (CL-2) LCN Closers
1 EA	Kick Plate	8400 B-CS 10" x 38"	US32 (KP-1) Ives
1 EA	Threshold	655A x 40"	(TH-2) Zero Int'l
1 EA	Gasketing	328AA x 40" x 92"	(GA-5) Zero Int'l
1 EA	Sweep	39A x 40"	(SW-3) Zero Int'l

HEADING #: 02

1 SGL Door: 35

3' 0" x 7' 2" x 1 3/4" HMD/HMF

3 EA	Hinge, Full Mortise, Hvy Wt	5BB1HW 4-1/2" x 4-1/2"	625 (HI-1) Ives
1 EA	Storeroom or Closet Lock	PBR 8805FL LC	625 (LO-8) ASSA ABLOY ACCENTRA
1 EA	Housing	C987	.626 (CY-1) Falcon
1 EA	Interchangeable Core	C606 .E	.625 (CY-2) Falcon
1 EA	Kick Plate	8400 B-CS 10" x 36"	US32 (KP-3) Ives
1 EA	Wall Stop	WS406CCV	626 (ST-2) Ives
3 EA	Silencer	608-RKW	(SI-1) Rockwood

HEADING #: 03

1 SGL Door: 36

3' 0" x 7' 2" x 1 3/4" HMD/HMF

3 EA	Hinge, Full Mortise, Hvy Wt	5BB1HW 4-1/2" x 4-1/2"	625 (HI-1) Ives
1 EA	Classroom or Office Lock	PBR 8809FL LC V21	625 (LO-9) ASSA ABLOY ACCENTRA
1 EA	Housing	C987	.626 (CY-1) Falcon
1 EA	Interchangeable Core	C606 .E	.625 (CY-2) Falcon
1 EA	Wall Stop	WS406CCV	626 (ST-2) Ives
3 EA	Silencer	608-RKW	(SI-1) Rockwood

HEADING #: 04

1 SGL Door: 34

3' 0" x 7' 2" x 1 3/4" HMD/HMF

3 EA	Hinge, Full Mortise, Hvy Wt	5BB1HW 4-1/2" x 4-1/2" 625 (HI-1) Ives
1 EA	Entry Lock	PBR 8807FL LC 625 (LO-7) ASSA ABLOY ACCENTRA
1 EA	Housing	C987 .626 (CY-1) Falcon
1 EA	Interchangeable Core	C606 .E .625 (CY-2) Falcon
1 EA	Wall Stop	WS406CCV 626 (ST-2) Ives
3 EA	Silencer	608-RKW (SI-1) Rockwood

HEADING #: 05

1 SGL Door: 20A, 20B

3' 0" x 7' 2" x 1 3/4" HMD/HMF

4 EA	Hinge, Full Mortise, Hvy Wt	5BB1HW 4-1/2" x 4-1/2" NRP 625 (HI-2) Ives
1 EA	Deadlock	8814-2 LC 625 (LO-10) ASSA ABLOY ACCENTRA
2 EA	Housing	C987 .626 (CY-1) Falcon
2 EA	Interchangeable Core	C606 .E .625 (CY-2) Falcon
1 EA	Push Plate	8200-4x16 625 (PP-1) Ives
1 EA	Pull Plate	8303-8-4x16 625 (PP-2) Ives
1 EA	Overhead Stop	904S 630 (OH-4) Glynn-Johnson
1 EA	Surface Closer	4040XP .RW62A .689 (CL-5) LCN Closers
1 EA	Kick Plate	8400 B-CS 10" x 34" US32 (KP-3) Ives
1 EA	Threshold	655A x 36" (TH-3) Zero I'ntl
1 EA	Gasketing	328AA x 38" x 94" (GA-6) Zero I'ntl
1 EA	Sweep	18100CNB x 36" TKSP (SW-7) Pemko

HEADING #: 06

1 SGL Door: 22, 24, 32

3' 0" x 7' 2" x 1 3/4" HMD/HMF

3 EA	Hinge, Full Mortise, Hvy Wt	5BB1HW 4-1/2" x 4-1/2" NRP 625 (HI-2) Ives
1 EA	Storeroom or Closet Lock	PBR 8805FL LC 625 (LO-8) ASSA ABLOY ACCENTRA
1 EA	Housing	C987 .626 (CY-1) Falcon
1 EA	Interchangeable Core	C606 .E .625 (CY-2) Falcon
1 EA	Kick Plate	8400 B-CS 10" x 38" US32 (KP-1) Ives
1 EA	Wall Stop	WS406CCV 626 (ST-2) Ives
3 EA	Silencer	608-RKW (SI-1) Rockwood

HEADING #: 07

1 SGL Door: 25, 26, 27, 29, 30, 31

3' 0" x 7' 2" x 1 3/4" HMD/HMF

1 EA	Hinge, Full Mortise, Hvy Wt	5BB1HW 4-1/2" x 4-1/2" NRP	625 (HI-2) Ives
1 EA	Dormitory Lock	PBR 8822FL LC V21	625 (LO-6) ASSA ABLOY ACCENTRA
1 EA	Interchangeable Core	C606 .E	.625 (CY-2) Falcon
1 EA	Housing	C987 .6-CCA .5622-IC	.626 (CY-3) Falcon
1 EA	Surface Closer	4040XP .RWPA .689	(CL-2) LCN Closers
1 EA	Kick Plate	8400 B-CS 10" x 34"	US32 (KP-3) Ives
1 EA	Threshold	655A x 36"	(TH-1) Zero I'ntl
1 EA	Gasketing	328AA x 38" x 94"	(GA-6) Zero I'ntl
1 EA	Sweep	18100CNB x 36" TKSP	(SW-5) Pemko

HEADING #: 08

1 DBL Door: 201A, 201B, 202A, 202B

PR 4' 10" x 3' 5" x 1 1/2" By Others

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.

3.06 SCHEDULE

A. See Room Finish Schedule on Drawings for locations.

B. Gypsum Board Assemblies located in Restroom Group C, Wall Type W3.

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 (Reapproved 2025).

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. 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. 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.

3.07 SCHEDULE

A. See Room Finish Schedule on Drawings for locations.

B. Locate in Restroom Groups B and C as shown in Drawings.

END OF SECTION

SECTION 09 6513
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.02 SUMMARY

A. Section Includes:
   1. Thermoplastic-rubber base.
   2. Rubber molding accessories.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees Fahrenheit or more than 90 degrees Fahrenheit.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees Fahrenheit or more than 95 degrees Fahrenheit, in spaces to receive resilient products during the following periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degrees Fahrenheit or more than 95 degrees Fahrenheit.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 THERMOPLASTIC-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Allstate Flooring
   2. Armstrong Flooring, Inc.
   3. Armstrong World Industries, Inc
   4. Johnsonite; a Tarkett company
   5. Nora by Interface

6. Roppe Corporation; Roppe Holding Company
7. VPI Corporation

B. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).
1. Group: I (solid, homogeneous).

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer’s standard lengths.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Toe: Coved base.

I. Colors: Architect shall select from manufacturer's standard colors.

2.02 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.04 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

3.05 SCHEDULE

A. See Room Finish Schedule on Drawings for locations - Note WB1.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. 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 and Exterior:
         1) Hollow Metal Doors and Frames.
         2) New and Existing Metal: Structural steel and steel exposed to view, joists, trusses, beams, miscellaneous ferrous metal, and Metal Decking.
         3) New and Existing Wood: Sheathing, Wood Decking, Interior of Clad Windows, Trim, and PVC trim.
         4) Drywall: Gypsum board walls, and similar items.
   2. Do not paint or finish the following:
      a. Ground Faced Concrete Masonry Units.
      b. Brick Masonry.
      c. Mortar in Masonry.
      d. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
      e. Stainless Steel Items.
      f. Exposed galvanized steel items, unless noted for paint.
      g. Items indicated to receive other finishes.
      h. Items indicated to remain unfinished.
      i. Equipment labels, equipment serial number and capacity labels, and operating parts of equipment.
      j. Roof membrane and roof flashings.
      k. Pre-finished metal flashings, counterflashings, coping, trim, fascia, gutters, and downspouts.
      l. Concrete floors.
      m. Concrete stem walls, and curbs.
      n. Existing and new concrete.
      o. Glass and glazing compounds.
      p. Joint sealants.
      q. Concealed pipes, ducts, and conduits.
      r. Aluminum.

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. 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.

B. 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.

C. 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.

D. 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.

3.07 SCHEDULE

A. Clean all painted interior and exterior surfaces using low pressure wash and light scrub cleaning methods and as described in specifications. Remove all loose paint – use paint stripper (when needed) scrape, clean, prime, and repaint as specified.

B. Remove all loose paint from wood surfaces – scrape, clean, prime, and repaint as specified.

C. Remove all paint from metal surfaces – use paint stripper, scrape, clean, prime, and repaint as specified.

D. Paint all exposed exterior and interior surfaces to include – existing and new structural steel elements, new and existing non-structural steel elements, knee wall cap, new and existing wood elements. Other specific elements include:
   1. Paint double pipe tie-off rail and associated supports and columns above knee wall on east Grid Line D on north and south elevation, and along entire east elevation.
   2. Paint existing wood clerestory windows and trim at west entrance along Grid Lines 10 and 11.

E. Do not paint masonry, concrete, prefinished trim, prefinished metal panels, gutters, downspouts, electrical/communications items, and plumbing/mechanical items.

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. 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. 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. Basis of Design: Activar Construction Products Group, Inc. - JL Industries, Model C2017.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Cold-rolled steel sheet.

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
   1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Acrylic sheet.
   1. Acrylic Sheet Color:
      a. Clear transparent acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide manufacturer's standard.
   2. Provide continuous hinge, of same material and finish as trim,, permitting door to open 180 degrees.

J. Accessories:
   1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as required.
      a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
         1) Location: Applied to cabinet door.
         2) Application Process: Pressure-sensitive vinyl letters.
         3) Lettering Color: Red.
         4) Orientation: Vertical.

K. Materials:
   1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
      a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
      b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      c. Color: White.
   2. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

L. Fabrication: Weld, fill, and grind components smooth.

M. Finish of Cabinet Exterior Trim and Door: Baked enamel, White color.

N. 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.

3.03 SCHEDULE

A. 2 locations as shown at Restroom Group B in Drawings.

B. 2 locations as shown at Restroom Group C in Drawings.

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 them 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 – NOT USED

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.
5. Valves for makeup water connections serving hydronic systems.

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 GATE VALVES

A. GT-1: 200 psig WSP, IBBM with non-toxic, corrosion resistant coating inside and out, FDA-approved, OS&Y, non-rising stem. Valve rated for 175 psi and designed to connect to the indicator post. Bolted bonnet, resilient solid wedge disc, completely and permanently encapsulated in rubber. Delrin Anti-friction thrust bearing. UL listed. AWWA C509 Acceptable Valve.

B. Coordinate end connection type with site utility contractor.

2.3 CHECK VALVES

A. CK-1: 125 psig WSP; 200 psig WOG; bronze body; brass, bronze, or 304 stainless steel trim; Y-pattern; horizontal swing; renewable/regrindable bronze seat disc.

B. CK-2: 125 psig WSP; 200 psig WOG; bronze body; brass, bronze, or 304 stainless steel trim; Y-pattern; horizontal swing; renewable/regrindable PTFE seat disc.

2.4 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, PTFE seats, 316 stainless steel ball, PTFE seals, corrosion resistant steel lever handles with vinyl grips, and balancing stop.

2.5 BALANCING VALVES

A. Manual Type

1. Acceptable Manufacturers:

    a. Bell & Gossett
    b. Conbraco
    c. Griswold
    d. Nexus
    e. Nibco
    f. Taco
    g. Victaulic

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 shall have the corresponding hot water recirculation temperature:

   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

2.6 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.

2.7 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.

2.8 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.

2.9 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 and as specified below:.

1. Install isolation valves at branch takeoffs from mains.

2. Install a common isolation valves for branch lines to each group of fixtures.

3. Install isolation valves above ceiling (in an accessible location) 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.

2. Building Water Service

   a. GT-1

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. Storm
7. 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.

PART 2 - PRODUCTS

2.1 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.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; ASME B16.51, NSF-61.

2.2 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.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 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.

2.10 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. Storm Piping: Pitch piping 1/8" per foot downward, in direction of flow, unless otherwise noted.

4. Vent Piping: Pitch 1/8" per foot upward, 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”.

C. Piping system for each restroom to include a branch routed to a floor sink within the respective chase with a shut-off valve at the branch take-off from the main to allow for system drain / blow down.

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 on metal decks.	A
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.

E. Water heaters serving emergency fixtures shall meet all requirements of ANSI Z358.1 for tepid water.

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.

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.

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.

F. Install an AGA lubricated plug valve on the gas connection. Gas supply branch shall have a 6" dirt leg with a threaded cap.

G. Vent Piping

1. Support horizontal piping on five (5) foot centers, maximum spacing, support vertical piping at every floor or ten (10) foot intervals maximum.

2. Install manufacturer provided concentric vent kit.

3. Terminate vent extension through roof with a bird proof vent top.

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/Conbraco, Watts/Febco/Ames, Zurn/Wilkins
Domestic Water Circulation Pumps	Armstrong, Bell & Gossett, Grundfos, Taco
Drainage Fixtures	Josam, Mifab, Smith, Sun, Wade, Watts, Zurn
Electric Water Coolers	Acorn, Elkay, Halsey Taylor, Haws, Murdock, Oasis
Expansion Tanks	Amtrol, Armstrong, Bell & Gossett, Elbi, Taco, Watts
Filter	Culligan, Everpure, Marlo, PEP, 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
Shower Fixtures	American Standard, Aqua Bath, Aquatic
Shower Trim	Bradley, Chicago Faucet, Lawler, Leonard, Moen Commercial, Powers, Symmons, Toto, 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.

1. 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.

3. 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.

4. 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.

B. 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.

C. 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.

D. 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.

E. 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.

F. 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.

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
Lavatory, VC, with back	Concealed arms
Lavatory, VC, no back	Concealed arms
Lavatory, ECI, with back	Exposed arms
Lavatory	Concealed arms
Lavatory	Through bolt
Water Closet	Bolt to comb. carrier and drainage fitting

FIXTURE	SUPPORTING DEVICE
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. Filters

1. Provide adequate service clearance in front of and below units to allow for removal and replacement of filters.

2. Include a shut off valve upstream of the filter to allow for service.

3. Provide pressure gauges upstream and downstream of multi-stage filters to monitor pressure drop for filter replacement.

G. 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.

H. Lavatories

1. Mount lavatories 34 inches from finished floor to rim unless otherwise specified.

I. Countertop Fixtures

1. Install fixture with securing devices supplied.

2. Set fixture on bedding of clear sealant, tighten securing devices and remove excess sealant.

J. 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. Floor Supported Fixtures:

a. Set fixture in bed of setting compound; remove excess.

3. After connections are tightened, install cap nuts and washers.

K. 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.

L. 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.
c. Clinical Sink: 24 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.

M. 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.

N. Roof Drains

1. Coordinate drain installation with deck and roofing Work.

2. Unless otherwise indicated by dimensions on the Drawings, locate drains as follows:

   a. Place drains minimum three (3) feet away from items on roof (parapets, walls, gravelstops, pipes, vents, scuttles, equipment and curbs, etc.) to allow for flashing.
   b. Install drains at low points of roof deck and where normal deck deflection will be at its maximum.

3. Drains in Cast Concrete: Set and securely brace drain body so that sump flange is level with, or slightly below surface of concrete.

4. Drains in Steel Decks: Install drains as shown on the Construction Work Drawings.

   a. Do not core drill or cut openings. Coordinate roof deck openings with Construction Work Contractor.
   b. Set sump receiver surface level with deck surface.
   c. Secure drain body with underdeck clamp.

5. Drains in Pre-cast and Pre-stressed Concrete Deck Units: Install drains as shown on the Construction Work Drawings.

   a. Do not core drill or cut openings.
   b. Coordinate roof deck openings with Construction Work Contractor. Set sump receiver surface level with deck surface.
   c. Secure drain body with underdeck clamp.

6. Fasteners

   a. Coat bolt threads with anti-seize lubricant before final installation.

O. 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.

P. Wall Hydrants: Installation Height: Minimum 18 inches above finished grade.

Q. Cleanout Plug: Lubricate threads with anti-seize lubricant before final installation.

R. 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
8. State or City Codes for the City of Des Moines, IA

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.

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. KEDbluestone 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. KEDbluestone 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. 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 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. 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

D. 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.

E. 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.

F. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

G. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

H. 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."

1.15 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.

1.16 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.

1.17 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 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.

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.

B. Lay-in Ceilings

1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided under other divisions are sufficient; no additional access provisions are required unless specifically indicated.

C. Plaster/Gypsum Walls and Ceilings

1. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers and similar wet areas, concealed hinges, screwdriver operated cam latch for general application, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needing service; minimum size is 12" by 12".

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 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. 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.

3.4 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.

3.5 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. Raised floor
    d. 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.

3.6 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.

3.7 OWNER TRAINING

A. Contractor shall include at least eight (8) hours for each maintenance staff shift group 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.

3.8 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. 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 #:

KEDbluestone Use:

Form Sent By:

Date:

KEDbluestone Project #:

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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

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

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

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 Concrete Filled Steel Decks

1. New Construction: Install metal deck ceiling bolts.

2. Existing Construction: Install welding studs (except at roof decks). Do not support a load in excess of 250 lbs from any single welded stud.

3. Do not attach hangers to decks less than 2-1/2 inches thick.

D. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.

E. 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.

F. Attachment to Cored Precast Concrete Decks: Toggle bolts may be installed in cells for the support of piping up to a maximum of 2-1/2 inches in size.

G. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks

1. New Construction: Omit block or tile and pour solid concrete with cast-in-place inserts.

2. Existing Construction: Break out block or tile to access, and install machine bolt anchors at highest practical point on side of web.

H. Attachment to Waffle Type Concrete Decks

1. New Construction: Install cast-in-place inserts.

2. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.

I. Attachment to Precast Concrete Tee Construction

1. New Construction: Tee hanger inserts between adjacent flanges, except at roof deck without concrete fill.

2. Existing Construction: Dual unit expansion shields in webs of tees. Install shields as high as possible in the webs.

a. Exercise extreme care in the field drilling of holes to avoid damage to reinforcing.
b. Do not use powder driven fasteners.

J. Attachment to Wood Construction: Secure hangers to the sides (only) of wood members, by means of malleable iron side beam connectors, or malleable iron or steel side beam brackets. Do not secure hanger attachments to nailing strips resting on top of steel beams.

1. Secure side beam connectors to wood members with two (2) No.18 x 1-1/2 inch long wood screws, or two (2) No.16 x 1-1/2 inch long drive screws. Do not support piping over 1-1/2 inches in size from side beam connectors. Do not hammer in wood screws.

2. Secure side beam brackets to wood members with steel bolts or lag screws. Do not use lag screws in wooden members having a nominal thickness (beam face) under two (2) inches in size. Install bolts or lag screws, in the sides of a timber or a joist, at the mid-point or above, not less than 2-1/2 inches from the lower edge when supporting branch lines and not less than three (3) inches from the lower edge when supporting mains. Install heavy gauge steel washers under all nuts.

3. Secure side beam brackets to wooden beams or joists, with lag screws or bolts of size as follows:

PIPE SIZE (Inches)	LAG SCREW SIZE (Inches)	BOLT DIAMETER (Inches)
2 and under	3/8 diameter x 1-3/4	3/8
2-1/2 and 3	1/2 diameter x 2	1/2
4 and 5	Use Bolt	5/8

a. Do not support piping larger than 3 inches with lag screws. Pre-drill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.
b. The minimum width of the lower face of wood beams or joints in which lag screws of size as specified may be used is as follows:

LAG SCREW DIAMETER (Inches)	NOMINAL WIDTH OF BEAM FACE (Inches)
3/8	2
1/2	3

4. Do not secure hanger attachment to the diagonals or vertical members of the trusses.

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.

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. Air Handling Units (AHU, RTU, ERV, Blower Coil, Makeup Air Units)
   b. Fans
   c. Terminal Devices (TAB, Heat Pumps, Fan Coil, Cabinet Heater, Unit Heater)
   d. Pumps
   e. Condensing Units

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

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
Storm	Green	White
Refrigerant Piping	Yellow	Black

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. High temperature water systems (supply and return):

a. Before final connections are made perform hydrostatic test at 450 psig for four (4) hours.
b. After final connections are made perform hydrostatic retest at a pressure equal to maximum operating design pressure, but not less than 250 psig for four (4) hours.

3.3 TESTING OF EQUIPMENT, APPARATUS AND APPURTENANCES

A. Low Pressure Steam Boilers: Perform hydrostatic test at 15 psig after installation with all piping connections shut-off.

B. Hot Water Boilers: Perform hydrostatic test at 30 psig, after installation, with piping connections shut-off.

C. Relief Valves: Increase pressure in equipment or apparatus to relief valve setting, to test opening of valves at required relief pressures.

3.4 HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS - CLEANING AND OPERATIONAL TESTING

A. Circulating Heating Hot Water and Chilled Water Systems in Buildings

1. Cleaning

a. Flush systems and apparatus, upon completion of pressure test(s).
b. Completely open valves and flush each system with clean water, prior to chemical cleaning.
c. Repeatedly flush at short intervals until twice the system water capacity has been flushed through.
d. Chemically clean systems immediately following flushing operations.
e. Circulate a solution consisting of trisodium phosphate, in a proportion of one (1) pound of chemical to every 50 gallons of water in the system.
f. Completely fill system with cleaning solution; vent as required, and place in operation, with automatic controls operating and valves fully open.
g. Allow system to reach design operating temperature or an operating temperature designated by the Director’s Representative.
h. Circulate the solution through the system for a minimum of four (4) consecutive hours; immediately drain system and flush with clean water until the pH at the farthest drain matches the clean water input.
i. Provide temporary pipe and /or hose required to drain system.

j. Keep strainers unplugged during cleaning operations. Remove and clean strainer screens prior to operational test.
k. Refill system with clean water and correct pH to 7.
l. Do not flush steam piping thru steam coils. Provide temporary steam supply and condensate piping to bypass steam coils.
m. Upon completion of flushing, remove temporary piping and reconnect steam coil.

2. Operational Test

a. Run system in an automatic mode for a minimum of 120 consecutive hours.
b. During this time, make final adjustments, including the setting of the balancing valves.

3.5 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.

3.6 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

1. Air Handling Equipment

a. Air handling units
b. Energy recovery ventilation units
c. Exhaust fans
d. Air inlets and outlets

2. Plumbing Equipment

a. Hot water circulation pump
b. 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.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB, or TABB.

2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.

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 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:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent

2. Air Outlets and Inlets: Plus or minus 10 percent

3. Heating-Water Flow Rate: Plus or minus 10 percent

4. Cooling-Water Flow Rate: 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

1. Precision Facility Solutions

2. System Management and Balance

3. 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 ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ductwork" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design". Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. 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:

1. Permanent electrical-power wiring is complete.

2. Hydronic systems are filled, clean, and free of air.

3. Automatic temperature-control systems are operational.

4. Equipment and duct access doors are securely closed.

5. Balance, smoke, and fire dampers are open.

6. Isolating and balancing valves are open and control valves are operational.

7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 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:

1. AABC's "National Standards for Total System Balance"

2. ASHRAE 111

3. NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems"

4. 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.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation”.

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 Ductwork."

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

2. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow

3. Measure fan static pressures as follows to determine actual static pressure:

4. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.

5. Measure static pressure a few feet downstream of a fan or in a location that will avoid turbulent or unrepeatable performance.

6. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

7. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

8. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

9. Report the cleanliness status of filters and the time static pressures are measured.

10. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

11. Balancer can adjust fan speeds 15% higher or lower than speed indicated in the approved shop drawing to meet the required capacity. If a fan needs to operate outside these parameters to meet the capacity requirements, balancer to contact the Engineer for approval. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance

12. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, sub-main ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of sub-main and branch ducts.

2. Where sufficient space in sub-main and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

3. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.

4. Re-measure each sub-main and branch duct after all have been adjusted. Continue to adjust sub-main and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.

2. Motor horsepower rating.

3. Motor rpm.

4. Efficiency rating.

5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.

7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 FINAL REPORT

A. General: Prepare a certified written report;

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.

2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves

2. Fan curves

3. Manufacturers' test data

4. Field test reports prepared by system and equipment installers

5. Other information relative to equipment performance; do not include Shop Drawings and product data

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page

2. Name and address of the TAB contractor

3. Project name

4. Project location

5. Architect's name and address

6. Engineer's name and address

7. Contractor's name and address

8. Report date

9. Signature of TAB supervisor who certifies the report

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
    d. Nomenclature sheets for each item of equipment.
    e. Data for terminal units, including manufacturer's name, type, size, and fittings.
    f. Notes to explain why certain final data in the body of reports vary from indicated values.

12. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Settings for supply-air, static-pressure controller.
    g. 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:

1. Quantities of outdoor, supply, return, and exhaust airflows.

2. Water and steam flow rates.

3. Duct, outlet, and inlet sizes.

4. Pipe and valve sizes and locations.

5. Terminal units.

6. Balancing stations.

7. Position of balancing devices.

3.9 INSPECTIONS

A. Initial Inspection

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

2. Check the following for each system:

    a. Measure airflow of at least ten (10) percent of air outlets.
    b. Measure water flow of at least five (5) percent of terminals.

c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents in the final report.

B. Final Inspection

1. 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 Owner / Construction Manager.

2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Owner / Construction Manager.

3. Engineer 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.

4. 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."

5. 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:

1. 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.

2. 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.

3.10 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 0713
DUCTWORK INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following Ductwork Insulation indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Insulation
2. Fasteners
3. Jacketing
4. Sealants

1.2 REFERENCES

A. Ductwork schedules located on Drawings.

B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed in the following references:

1. NFPA 90
2. ASTM

C. Abbreviations

1. K: Thermal Conductivity, in Btu per inch thickness per hour per square foot.
2. PVC: Polyvinylchloride

1.3 SUBMITTALS

A. Product Data

1. Manufacturer's catalog sheets and specifications for insulation materials and jacket materials.
2. Materials Schedule: Itemize insulation materials and thicknesses for each specified application in Insulation Material Schedules in Part 3 of this Section. Where optional materials are specified, indicate option selected. Schedule should be similar to Ductwork schedule on Drawings.

1.4 QUALITY ASSURANCE

A. Qualifications: The persons installing the Work of this Section and their Supervisor 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 duct lining materials, laminated jackets, mastics, sealants and adhesives shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

PART 2 - PRODUCTS

2.1 ADHESIVES

A. 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).

B. Calcium Silicate Adhesive: fibrous, sodium-silicate-based adhesive with a service temperature range of 50° F - 800° F (10° C - 427° C).

C. 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).

D. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

E. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, class 2, Grade A.

F. 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.

G. PVC Jacket Adhesive: Compatible with PVC jacket.

2.2 MASTICS

A. 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).

B. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

2.3 LAGGING ADHESIVES

A. 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).

B. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

2.4 BANDING

A. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316 as required to match jacketing material; 0.015 inch thick, 3/4 inch wide with wing seals.

B. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seals.

2.5 SEALANTS

A. 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).

2.6 INSULATION

A. Ductwork Insulation Types

1. Type A: Flexible fiberglass duct wrap. Minimum density 0.75 #/ft^3, K of 0.30 at 75° F; ASTM C 553, Type II.

2. Type B: Semi-rigid fiberglass board wrap. Minimum density 3.0 #/ft^3, K of 0.23 at 75° F; ASTM C612, Type IA.

3. Type C: Flexible fiberglass duct liner. Minimum density 3.0 #/ft^3, K of 0.24 at 75° F; ASTM C 1071. Liner between insulation and airstream side of double-wall ductwork shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

4. Type D: Preformed rigid fiberglass duct liner. Minimum density 3.0 #/ft^3, K of 0.23 at 75°F; ASTM C 1071. Liner shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84

5. Type E: Flexible mineral fiber duct wrap (Suitable for Temperatures Up to 1800° F). Minimum density 6 #/ft^3; ASTM E 2336, NFPA 96-2011, UL 1978 (Rev. 6-02). Two (2)-hour fire separation rating with zero clearance to combustibles. Thickness shall be as specified or as required by AHJ to meet fire separation requirements.

6. Type F: Flexible fiberglass duct liner for spiral ductwork. Minimum density 3.0 #/ft^3, K of 0.23 at 75° F; Liner shall have a Fire Spread/Smoke Developed Rating of 25/50 or less based on ASTM E 84.

B. Fire resistant, anti-erosion, and anti-microbial coating on lining interior to duct; NFPA 90-A and 90-B.

C. All insulation densities listed are minimum densities. Contractor shall be responsible for verifying the required insulation thickness & density to meet the minimum installed insulation R-values as listed in the ductwork schedules on the drawings.

PART 3 - EXECUTION

3.1 DUCT INSULATION SCHEDULE

A. Refer to Ductwork Application Schedule on Drawings for insulation requirements.

3.2 PREPARATION

A. Perform the following before starting insulation work.

1. Install hangers, supports and appurtenances in their permanent locations.

2. Complete testing of piping, ductwork, and equipment.

3. Clean and dry surfaces to be insulated.

3.3 INSTALLATION, GENERAL

A. Install the work of this section in accordance with the manufacturer's printed installation instructions unless otherwise specified.

3.4 INSTALLATION AT HANGERS AND SUPPORTS

A. Reset and realign hangers and supports if they are displaced while installing insulation.

B. Insulation inserts for use with fibrous glass insulation:

1. Ductwork: Install 6 #/ft^3 density jacketed fibrous glass board, same thickness as adjoining insulation, sized for full bearing on supporting trapeze member, and as required to enable abutting to adjoining insulation and overlapping of jacketing.

3.5 INSTALLATION OF DUCTWORK INSULATION

A. Exterior to Ductwork

1. Cut insulation to stretch-out dimensions as recommended by insulation manufacturer.

2. Remove two (2) inch wide strip of insulation material from the jacketing on the longitudinal and circumferential joint edges to form an overlapping staple/tape flap.

3. Install insulation with jacketing outside so staple/tape flap overlaps insulation and jacketing on other end.

4. Butt ends of insulation tightly together.

a. Rectangular and Square Ductwork: Do not compress insulation at duct corners.

5. Staple longitudinal and circumferential joints with outward clinching staples minimum six (6) inches on center, and seal with pressure sensitive sealing tape.

6. Cut off protruding ends of fasteners flush with insulation surface and seal with pressure sensitive sealing tape.

7. Install duct insulation fasteners on bottom side of horizontal duct runs, when bottom dimension of the duct is in excess of 24 inches in width.

8. Install duct insulation fasteners on sides of duct risers having a dimension over 24 inches in size.

9. Seal tears, punctures, and penetrations of insulation jacketing with sealing tape.

B. Interior to Ductwork

1. Insulate ducts prior to erection in place when ducts are required to be installed proximate to walls, ceilings, equipment or other ductwork, which will not permit adequate space for installation of insulation after ducts are installed.

2. Line interior surfaces of ducts with thermal and acoustic board insulation, when the specified application of exterior insulation is impractical.

   a. Written permission from the Engineer must be received, prior to the substitution of lined ducts for exterior insulated ducts.
   b. Maintain interior cross-sectional areas of ducts, as noted on drawings.

3.6 FIELD QUALITY CONTROL

A. Field Samples: The Director's Representative, may at his discretion, take field samples of installed insulation for the purpose of checking materials and application. Reinsulate sample cut areas.

3.7 DUCTWORK SERVICE INSULATION SCHEDULE

A. Insulate all ductwork except where otherwise specified. See Ductwork schedule on Drawings.

B. Notes

1. Equipment: Insulate air handling equipment, not furnished with factory applied insulated jacket or internal insulation, with minimum 1-1/2 inch thick fibrous glass board with an ASTM C 1136 Type I jacket, installed and finished as specified for exposed ductwork in finished spaces.

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. 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. PVC Jackets and Premolded Fitting Covers

1. Constructed of high impact, UV resistant PVC. 0.020” thickness.

   a. ASTM D 1784, Class 14253-C.
   b. Working Temperature: 0-150° F.

B. Self-Adhesive Outdoor Jackets:

1. Self-Adhesive Outdoor Jacket: 15-mil thick, laminated vapor barrier and waterproofing membrane for installation over insulation located above ground and outdoors; consisting of a multi-layered laminate coating with acrylic adhesive covered with white aluminum-foil facing.

C. 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.

D. 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 FIBROUS GLASS HOT SERVICE INSULATION

A. Install insulation materials with 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 adhesive backed butt strips.

   a. Substitution: 3" wide pressure sensitive sealing tape, of same material as the jacket, may be used in lieu of butt strips.

2. Fill voids in insulation at hanger with insulating cement.

3. Exceptions:

   a. Piping in Accessible Shafts, Attic Spaces, Crawl Spaces, Unfinished Spaces and Concealed Piping: Butt insulation joints together and secure minimum 1-1/2" wide longitudinal jacket laps and 3" wide butt strips of same material as jacket, with outward clinching staples on maximum 4" centers. Fill voids in insulation at hangers with insulating cement.
   b. Piping in Tunnels: Butt insulation joints together and secure minimum 1-1/2" wide longitudinal jacket laps and 3" wide butt strips, of same material as jacket, with outward clinching staples on maximum 4" centers and 16 gauge wires a minimum of four (4) loops per section. Fill voids in insulation with insulating cement.

C. Fittings, Valves, Flanges and Irregular Surfaces

1. Insulate with mitre cut or pre-molded fitting insulation of same material and thickness as insulation.

2. Secure in place with 16-gauge wire, with ends twisted and turned down into insulation.

3. Butt fitting, valve and flange insulation against pipe insulation, and fill voids with insulating cement.

4. Insulate valves up to and including bonnets, without interfering with packing nuts.

5. Apply leveling coat of insulating cement to smooth out insulation and cover wiring.

6. After insulating cement has dried, coat insulated surface with lagging adhesive, and apply 4 oz or 6 oz canvas jacket as required by pipe size.

   a. Lap canvas jacket on itself and adjoining pipe insulation at least 2".
   b. Size entire canvas jacket with lagging adhesive.

7. Piping Systems (below 250° F)

   a. Valves, fittings and flanges may be insulated with pre-molded PVC fitting jackets, with fibrous glass insulation inserts.
      1) The surface temperature of PVC fitting jacket not to exceed 150° F.

3.6 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.

3.7 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.

3.8 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 Piping Application Schedule on Drawings for Piping Insulation 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.

D. Notes:

1. Insulate cold condensate drain piping connected to drain pans under cooling coils within unit enclosure, except where over drain pans:

3.11 SCHEDULE OF PVC JACKETING FOR INSULATED PIPE

A. Install PVC jacketing on all exposed piping located within an enclosed space, 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.

3.12 SCHEDULE OF SELF-ADHESIVE OUTDOOR JACKETS FOR INSULATED PIPE

A. Install self-adhesive outdoor jacketing on all exposed piping not located within an enclosed space.

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. Submit CAD drawn duct layout drawings for all project ductwork. Submit detailed elevations and sections where required to convey complete scope of work. Shop drawings shall be based on other trades contract drawings and field dimensions. Submit drawings on full size paper at 1/4” = 1’-0” scale.

2. 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.

3. Layout and fabrication details for cooking equipment exhaust ductwork.

4. Layouts of mechanical equipment rooms and penthouses.

5. Details of intermediate structural steel members required to span main structural steel for the support of ductwork.

6. 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, ASTM A924, Class LFQ (lock forming quality), coating designation G-60.

3. Galvannealed Steel: ASTM A653, ASTM A924, Class LFQ (lock forming quality), coating designation A-40.

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 ductwork from galvanized sheet metal, except as follows:

1. Fabricate the following ductwork from aluminum:

   a. Inlet and discharge ductwork connected to cooling towers and evaporative condensers.
   b. Exhaust ductwork from shower, locker, can washing and steam service rooms, and swimming pool areas.
   c. Dryer exhaust ductwork. Aluminum ductwork for dryer exhaust shall be a minimum of 26 gauge.

2. Fabricate the following ductwork from galvannealed steel:
   a. Ductwork in exposed areas that will be painted.

D. Dissimilar Metals: Separate dissimilar metals used for ductwork with 12 oz vinyl coated woven fiberglass duct connector fabric, such as Duro Dyne's Glasseal. No separation is required between screws or rivets and the materials in which they are inserted.

2.3 REGISTERS AND GRILLES INSTALLED IN EXPOSED DUCTWORK

A. Frames are not required for registers and grilles installed directly in un-insulated exposed ductwork.

B. Cut openings in ducts, forming a double thickness of metal, to attach registers or grilles with sheet metal screws. Bend back edges of openings into duct, on all four (4) sides, a minimum of 1 inch to provide the thickness of metal stated above. Provide felt or sponge rubber gasketing, all four (4) sides of duct openings, for supply grilles and supply registers.

2.4 AIR DIFFUSERS INSTALLED IN EXPOSED DUCTWORK

A. Frames are not required for diffusers installed directly in un-insulated exposed ductwork.

B. Cut and form openings in ducts, to accommodate the specified volume control damper and adjustable equalizing grid assembly. Reinforce openings as required and approved. Provide felt or sponge rubber gasketing, around duct opening, for supply diffuser assemblies.

2.5 VIBRATION ISOLATION FOR DUCTWORK

A. Type: Combination rubber and spring type designed for insertion in a split hanger rod for isolating ductwork from the overhead construction.

1. Approved isolators: Amber Booth Type BSSR, Korfund Type VX, Mason Industries, Type DNHS, Vibration Eliminator Co. Type SNRC and Vibration Mountings and Controls Type RSH.

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. Horizontal Ductwork for Dishwashing, and Other Scullery Equipment Exhausts

a. Continuously solder transverse joints vaportite along bottom, and up both sides two (2) inches minimum.
b. Continuously solder longitudinal seams vaportite if seams are approved to be located at bottom of duct.

4. 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 HANGERS FOR DUCTS, 2 INCHES W.G. AND OVER

A. Install hangers for ducts as specified in the SMACNA Manual, with the following exceptions:

1. Support rectangular ducts with welded seams, regardless of size, by means of trapeze hangers, framed all four (4) sides. Provide minimum 1 x 1 x 1/8 inch angle iron framing for duct having a maximum side dimension up to and including 36 inches in size. Install framing snug to all four (4) sides of duct.

3.5 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. Attachment to Concrete Filled Steel Decks

1. New Construction: Install metal deck ceiling bolts.

2. Existing Construction: Install welding studs (except at roof decks).

3. Do not attach hangers to decks less than 2-1/2 inches thick.

D. Attachment to Existing Cast-In Place Concrete

1. Secure hangers to overhead construction with self drilling type expansion anchors and machine bolts.

2. Secure hanger attachments required to be supported from wall or floor construction with single unit expansion anchors or self drilling type expansion anchors and machine bolts.

E. Attachment to Cored Precast Concrete Decks (Flexicore, Dox Plank, Spancrete, etc.): Toggle bolts may be installed in cells for the support of ducts up to a maximum of 60 inches in width.

F. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks

1. New Construction: Omit block or tile and pour solid concrete with cast-in-place inserts.

2. Existing Construction: Break out block or tile to access and install machine bolt anchors at highest practical point on side of web.

G. Attachment to Waffle Type Concrete Decks

1. New Construction: Install cast-in-place inserts.

2. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.

H. Attachments to Precast Concrete Tee Construction

1. Secure hangers to tees by any of the following methods:

a. Tee hanger inserts between adjacent flanges.
b. Install double unit expansion anchors and machine bolts at highest practical point on side of web.

I. Attachment to Wood Construction

1. Secure strap hangers to the sides of wood beams with one (1) No. 18 x 1-1/2 inch long (minimum) wood screws or two (2) No. 16 x 1-1/2 inch long (minimum) drive screws. Do

not hammer in wood screws.

2. Secure rod hangers to angle iron clip angles, bolted or screwed to the sides of the wood beams with 3/8 inch bolts or 3/8 inch lag screws. Install hanger rods with a threaded end through a hole in the angle, secured with a double nut, one (1) above and one (1) below the angle. Do not use lag screws in wood beams, having a nominal face width under 2 inches. Install bolts or lag screws in the side of beams at mid-point or above.

3. Pre-drill holes for lag screws 1/8 inch in diameter less than the root diameter of the lag screw thread.

4. Where wood trusses are approved to support ductwork, hangers may be attached only to the bottom chord. Method of attachment must be specifically approved.

5. Do not secure hanger attachments to nailing strips resting on top of steel beams.

3.6 DUCT RISER SUPPORTS, UNDER 2 INCHES W.G.

A. Support vertical round ducts by means of double-ended split steel pipe riser clamps bearing on floor slabs or adjacent structural members, at every other floor through which the riser passes.

B. 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

3.7 DUCT RISER SUPPORTS, 2 INCHES W.G. AND OVER

A. Support vertical round ducts by means of double-ended split steel pipe riser clamps welded to the ducts and bearing on floor slabs or adjacent structural members, at every other floor through which the riser passes.

B. Support vertical rectangular ducts by means of two steel angles or channels, anchor bolted to floor slab or adjacent structural member at every other floor through which the riser passes. Secure steel angles or channels to a transverse joint by means of 3/8 inch bolts, or by welding. Size supports as follows:

MAXIMUM SIDE DIMENSION (inches)	SUPPORT ANGLE (inches)	SUPPORT CHANNEL (inches)	MINIMUM BEARING AT EACH END (inches)
36	1 x 1 x 1/8	1 x 1/2 x 1/8	2
48	1-1/2 x 1-1/2 x 1/8	1-1/2 x 3/4 x 1/8	3
60	2 x 2 x 1/8	2 x 1 x 1/8	3
61 - up	2-1/2 x 2-1/2 x 3/16	2 x 1 x 3/16	4

3.8 VIBRATION ISOLATION FOR DUCTWORK

A. Install vibration isolation in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Install in locations shown or scheduled on the Drawings.

C. High Velocity Ductwork Installed within Mechanical Equipment, Machine and Penthouse Mechanical Equipment Rooms: Provide combination rubber and spring type isolators, designed for insertion in a split hanger rod for overhead supported ductwork and double rubber-in-shear isolators for floor supported ductwork. Provide isolators designed for a static deflection of 1/2 inch.

3.9 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. Provide openings in ductwork where required to accommodate thermometers, controllers, and other devices. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring. Sleeve of pitot tube opening shall be no more than one inch long. Opening shall be one inch wide to accept pitot tube.

5. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

6. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

7. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout. Use polished stainless steel for ductwork exposed to view and mill stainless steel for ducts where concealed.

8. All visible welds in ductwork between biosafety cabinets, canopy hoods and fume hoods and the ceiling shall be ground and polished.

9. 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. All exposed ductwork shall have a 'paintgrip' finish to allow for normal paint application without additional field labor by the painter. See architectural drawings for areas with exposed ceiling to be painted.

4. 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.

3.10 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.

3.11 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. Flexible Duct
3. Flexible Duct Elbow Supports
4. Flexible Duct Connections
5. Screens
6. Duct Test Holes
7. Turning Vanes

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.

B. Record Documents

1. Fire Dampers: The damper manufacturer's literature submitted for approval prior to the installation shall include performance data developed from testing in accordance with AMCA 500D standards and shall show the pressure drops for all sizes of dampers required at anticipated air flow rates. Maximum pressure drop through fire damper shall not exceed 0.05-inch water gauge.

2. Combination Fire/Smoke Dampers: Assign identification numbers for each damper with corresponding number noted on Drawings. Provide air quantity, size, free area of damper, pressure drop and proposed velocity through each damper. Provide manufacturer's data of damper and its accessories or options. At Owner's request, provide two (2) dampers (18 inch x 12 inch) for the purpose of illustrating damper operation to Owner's operating and maintenance personnel.

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 FLEXIBLE DUCTS

A. Acceptable Manufacturers

1. Flexmaster U.S.A., Inc.

2. McGill AirFlow LLC.

3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

4. Thermaflex

B. Insulated, Flexible Duct:

1. Certifications:

a. UL 181,
b. ETL Class 1
c. NFPA 90A and 90B
d. Greenguard

2. Construction:

a. Single ply inner liner constructed of chlorinated polyethylene
b. Corrosion resistant galvanized steel core
c. Fibrous glass insulation with a minimum value of R-6.
d. Polyethylene vapor barrier film

3. Pressure Rating: 6-inch wg positive and 2-inch wg negative

4. Maximum Air Velocity: 5000 fpm

5. Temperature Range: -10° F to 160° F

6. Flame spread rating less than 25

7. Smoke developed rating of less than 50

2.4 FLEXIBLE DUCT ELBOW SUPPORTS

1. Acceptable Manufacturers

a. Build Right Products - FlexRight
b. Thermaflex – FlexFlow Elbow
c. RPS - FlowRite

2. Construction

a. Universal-mount, 1-piece, fully adjustable, radius-forming brace to support 4-inch through 16-inch diameter flexible air ducts.
b. Classified: UL 2043.
c. Material: 100 percent recycled copolymer polypropylene.
d. Support Frame Radius: 8 inches.
e. Compliance for Flexible Duct Radius:
1) SMACNA HVAC Duct Construction Standards.
2) ASHRAE Advanced Energy Design Guides.
3) ADC Flexible Duct Performance and Installation Standards.

2.5 FLEXIBLE CONNECTIONS

A. Where ducts connect to equipment, flexible connections shall be made using “Flexmaster TL-M” or “Ventglas” fabric that is temperature-resistant, fire-resistant, waterproof, mildew-resistant and practically airtight, weighing approximately thirty ounces (30 oz.) per square yard.

B. Material used outdoors shall be resistant to ultra-violet sunrays. There shall be a minimum of 1/2" slack in the connections, and a minimum of 2 1/2" inches distance between the edges of

the ducts. This does not apply to air handling units with internal isolation. A more rugged flexible material that is resistant to ultra-violet rays needs to be used when connecting an exhaust fan or exhaust air plenum to ductwork.

2.6 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.

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. Flexible Connections

1. Install flexible connectors to connect ducts to equipment.

2. Flexible fabric connections installed at equipment exterior to the building shall be rated UV exposure and suitable for exterior use per ASTM G155 testing requirements. Metal for these connections shall be aluminum or stainless steel, galvanized connections shall not be allowed.

3. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

4. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Cover connections to medium and high pressure fans with leaded vinyl sheet, held in place with metal straps.

5. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

F. Flexible Duct

1. Connect terminal units to supply ducts directly or with maximum 36-inch lengths of flexible duct. Do not use flexible ducts to change directions.

2. Fittings on terminal units and on sheet metal duct shall have flexible duct core slipped over duct and coupling or clamp tightened, then connection sealed with sealant. Insulation of flexible duct shall be slipped over connection to point where insulation abuts terminal unit or insulation on duct.

3. These insulation connections shall be sealed by embedding fiberglass tape in the sealant and coating with more sealant to provide a vapor barrier.

4. The terminal ends of the duct core shall be secured by compression coupling or stainless steel worm gear type clamp.

5. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

6. Support flexible ducts as per SMACNA standards to prevent sags, kinks and to have 90 degree turns.

G. Flexible Duct Elbow Supports

1. Install flexible duct elbow supports in accordance with manufacturer's instructions.

2. Install flexible duct elbow supports over outer jacket of flexible ducts to form smooth, 90-degree bends to eliminate flexible duct kinks and airflow restrictions.

3. Make bends in flexible ducts with minimum of 1-duct diameter centerline radius.

4. Install flexible duct elbow supports at flexible duct 90-degree bends at following locations:

a. Diffusers.
b. Grilles.
c. Registers.
d. Duct take-offs and taps.
e. Air devices with round inlets and outlets.
f. HVAC equipment with round inlets and outlets.
g. As indicated on the Drawings.

H. 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.

I. Backdraft Dampers

1. Provide backdraft dampers on exhaust fans or exhausts ducts where indicated. Install dampers so that they will open freely.

J. 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.

3. Access doors as specified elsewhere shall be provided for access to all parts of the fire and combination fire and smoke dampers. Doors shall open not less than 90 degrees following installation and shall be insulated type where installed in insulated ducts.

3.2 TESTING

A. After each fire damper, smoke damper and combination fire and smoke damper has been in

stalled and sealed in their prescribed openings and prior to installation of ceilings, Contractor shall, as directed by Owner, activate part or all dampers as required to verify “first-time” closure.

B. Activation of damper shall be accomplished by manually operating the resettable link, disconnecting the linkage at the fire damper fusible link, and manually operating the fire/smoke damper through the electronic controls as appropriate.

C. Failure of damper to close properly and smoothly on the first attempt will be cause to replace the entire damper assembly.

D. Coordinate smoke damper system interlock requirements with the fire alarm system.

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. Ceiling-mounting 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 CEILING-MOUNTED 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. Broan Mfg. Co., Inc.

2. Greenheck

3. Loren Cook Company

4. NuTone Inc.

5. Pennbarry

6. Soler & Palau

7. Captiveaire

C. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

D. Housing: Steel, lined with acoustical insulation.

E. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

F. Grille: Plastic Stainless steel Aluminum Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

G. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

H. Accessories

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.

3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.

4. Motion Sensor: Motion detector with adjustable shutoff timer.

5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.

6. Filter: Washable aluminum to fit between fan and grille.

7. Isolation: Rubber-in-shear vibration isolators.

8. Manufacturer's standard roof jack or wall cap, and transition fittings.

I. 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.

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:

a. As scheduled on Drawings

2.3 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 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. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

C. Support suspended units from structure using threaded steel rods and hangers/supports having a static deflection as scheduled on Drawings. Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

D. Install units with clearances for service and maintenance.

E. 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 damper linkages for proper damper operation.

6. Verify lubrication for bearings and other moving parts.

7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.

9. Shut unit down and reconnect automatic temperature-control operators.

10. 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 3439
HIGH VOLUME, LOW SPEED FANS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all work required to provide and install the HVLS Fans indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section:

1. High Volume, Low Speed Fans (HVLS Fans)

1.2 REFERENCES

A. The most recently adopted 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 13 - Standard for the Installation of Sprinkler Systems
11. NFPA 70 - National Electrical Code
12. UL 507 - Standard for Safety Electric Fans

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. Fan speed controllers

6. Installation manuals

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.

3. Air Velocity Profiles: CFD analysis showing airflow velocities (ft/min) in designed space.

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. Suspension assembly members.

2. Size and location of initial access modules for acoustical tile.

3. Open-Ceiling items including light fixtures, diffusers, grilles, speakers, sprinklers, and special moldings.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For HVLS 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. 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.

C. Fabrication: Conform to AMCA 99.

D. Performance Base: 50 feet above sea level.

E. Fans shall be capable of operating stably at all speeds.

F. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

G. UL Standard: HVLS fans shall comply with UL 507.

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.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of fans that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For motor, including controls: 5 years from substantial completion.
b. For Hub and Airfoils: Lifetime warranty for parts.
c. For Labor: One year from substantial completion.

PART 2 - PRODUCTS

2.1 HIGH VOLUME, LOW SPEED 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. Big Ass Fans

2. Hunter Fan

3. MacroAir Fans

4. Skyblade

C. Description: Factory-assembled and -tested horizontal, non-ducted fan unit, consisting of large-diameter blade set, direct-driven or gear-driven motor, with variable-speed motor controller.

D. Performance: See schedule on drawings for performance information.

E. Hub: Fabricated of high strength steel or aluminum. The hub shall be secured to the output shaft of the gearbox and shall incorporate retaining clips that shall restrain the hub/airfoil assembly.

F. Airfoils: The fan airfoils shall be constructed out of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with stainless steel retainers. Each airfoil shall be equipped with a winglet to enhance efficiency and effectiveness of the fan.

G. Gearbox: The gearbox shall incorporate a cast iron housing, double lip output seals, and a solid output shaft. Gearbox shall be sealed for ease of service with lifetime synthetic oil to exclude contaminants.

H. Mounting: The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The design shall allow for adjustments to be made after the mount is installed to the mounting structure to ensure the fan will hang level from the structure. All mounting bolts shall be SAE Grade 8 or equivalent.

I. Safety cables: The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure.

J. Accessories

1. Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2.2 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Ceiling Units: Suspend units from structure; use steel wire or metal straps as required for stability.

C. Support suspended units from structure using manufacturers provided mounting arm.

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. 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. Verify lubrication for bearings and other moving parts.

6. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

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 Diffusers

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.

B. Submit color and finish samples for all louvers.

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 – Supply

1. Aluminum or Steel, as scheduled.

2. 1 1/4" wide borders to have a minimum of 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. 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.

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 7200
ENERGY RECOVERY VENTILATION UNITS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the following equipment indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section:

1. Fixed-plate total air-to-air heat exchanger elements
2. Air filters and frames
3. Blower fans and motors
4. Electrical characteristics
5. Operational controls

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

3. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance: Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Rating Air-to-Air Energy Recovery Equipment."

C. UL Compliance: Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators".

D. NFPA 90A AND 90B for 25/50 fire/smoke spread index ratings using UL Standard 723 testing.

1.4 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other trade construction within ceiling space, including light fixtures, ductwork, fire alarm, plumbing piping, wall and partition assemblies.

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

C. Coordination Drawings: Include with ductwork coordination-layout drawings. Provide plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which equipment or suspension systems will be attached.
3. Attaching ductwork.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Fixed-Plate Total Heat Exchangers:

a. Core: ten (10) years.
b. Remaining items: two (2) years

PART 2 - PRODUCTS

2.1 FIXED-PLATE TOTAL HEAT EXCHANGERS

A. Acceptable Manufacturers: Subject to compliance with requirements:

1. RenewAire, LLC.
2. Lennox, Inc.
3. Mitsubishi Electric Sales Canada Inc.
4. Prior approved equal.

B. Construction:

1. Casing: Galvanized, 20-gauge steel, with lapped corners.

2. Fixed-plate energy-exchange element. Energy-exchange module shall be of fixed-plate cross-flow construction, with no moving parts.

3. Flange components shall be provided suitable for connection of ductwork.

4. Access doors shall provide easy access to blowers, energy transfer elements, and filters. Panel shall be gasketed to provide air-tight seal.

5. Case walls and doors shall be insulated with 1" FSK high-density board insulation, without exposure of fresh air to glass fibers.

C. Plates: Evenly spaced and sealed and arranged for cross or counter airflow.

1. Plate Material: Chemically treated resin-coated paper with selective hydroscopicity and moisture permeability, and gas barrier properties.

2. Capable of transferring both sensible and latent energy between air streams. Latent energy transfer shall be accomplished by direct water vapor transfer from one air stream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

3. Water vapor transfer shall be through molecular transport by hydroscopic resin and shall not be accomplished by "porous plate" mechanisms. Exhaust and fresh airstreams shall at all times travel in separate passages, and airstreams shall not mix.

4. Airflow through the energy exchange element shall be laminar, with no deposition of particulates on the interior of the energy exchange plate material.

D. Passive Frost Control:

1. Energy-transfer element shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%).

2. Occasional extreme conditions shall not affect the usual function or performance of the element. No condensate drains will be required.

3. Unit shall have the capacity to operate continuously without the need for bypass, recirculation, pre-heaters, or defrost cycles under normal operating conditions.

E. Disposable Panel Filters:

1. Energy-exchange element shall be protected by pleated, disposable filters; one for outdoor air, one for return air, directly upstream of exchange element.

2. Comply with NFPA 90A.

3. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

4. Provide filter holding frames arranged for flat or angular orientation, with access doors on side of unit for service. Filters shall be removable from one side or lift out from access plenum.

5. Factory-fabricated, viscous-coated, flat-panel type.

6. Size: 20"x20"x2" thick, pleated media.

7. Initial Resistance: 0.10" wc.

8. Recommended Final Resistance: 0.25" wc.

9. Arrestance (ASHRAE 52.1): 80.

10. MERV: 8.

11. Media: Interlaced glass fibers sprayed with nonflammable adhesive.

12. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.

2.2 CAPACITIES AND CHARACTERISTICS

A. Performance capacities, characteristics, and operating conditions: See equipment schedule on drawings.

B. Blower Fans:

1. Forward curved centrifugal with direct drive.

2. Internally vibration isolated from casing.

3. Motors shall be thermally protected with automatic reset, or supplied with starters.

4. Wire motors and controls so only external connections are required during installation.

5. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 15 Section "Common Motor Requirements for HVAC Equipment."

6. Motor Sizes: Minimum size as scheduled on drawings. No driven load will require motor to operate in service factor range above 1.0.

C. Electrical:

1. Single point power connection.

2. Internal 24 volt control power transformer.

3. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 16 Sections

D. Operation Controls:

1. See Notes under equipment schedule on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Follow all manufacturer’s installation instructions.

B. Install fixed-plate heat exchangers so supply and exhaust airstreams flow in cross-flow directions. Verify duct air streams and flow directions prior to making ductwork connections.

C. Suspended Units: Suspend units from structural-steel support frame using threaded steel rods and spring hangers. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

D. Install units with clearances for service and maintenance. Verify full travel of access doors for filter and blower fan sections.

E. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.2 CONNECTIONS

A. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."

B. Install piping adjacent to machine to allow service and maintenance.

END OF SECTION

SECTION 23 7314
BLOWER COIL UNITS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the Blower Coil indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Equipment Included in This Section

1. Blower Coil Units

a. DX
b. Electric

1.2 REFERENCES

A. Vibration Isolation: Section 230550

B. Air Filters: Section 234100

1.3 SUBMITTALS

A. Provide submittals as required in Section 15010 or 230500

B. Product Data

1. Catalog sheets, brochures, performance charts, standard schematic drawings, specifications and installation instructions for each air handling unit.

C. Contract Closeout Submittals

1. Operation and Maintenance Data: Deliver two (2) copies covering the installed products to the Owner.

1.4 QUALITY ASSURANCE

A. Source Quality Control: Factory test units in accordance with ARI Standard 430 - Central-Station Air-Handling Units.

PART 2 - PRODUCTS

2.1 CONFIGURATION AND PERFORMANCE

A. Refer to the equipment schedules for additional configuration and performance requirements.

2.2 BLOWER COIL UNITS

A. Acceptable Manufacturers

1. Daikin
2. Enviro-Tec
3. First Co
4. IEC
5. Johnson Controls
6. Krueger
7. Magic Aire
8. Titus
9. Trane
10. Whalen
11. Williams

B. General Design: Sectional constructed unit which is structurally self supporting, gasketing between adjoining sections.

C. Unit Configuration – Refer to the schedules and drawings for specific requirements

1. Vertical Units

a. Direct drive fans
b. Electric heating coil (reheat position)
c. Hot water heating coil
d. Cooling coil (DX)
e. Mixing box with outside air and return air dampers
f. Base rail

2. Coils - Verify type of coil required based on equipment schedules

a. DX Coils:

1) General Requirements:
a) All coils shall be 1/2" O.D. seamless copper tubes with collared aluminum fins.
b) Tubes shall be mechanically expanded to provide an efficient bond between tube and fin.
c) All water coils shall be provided with a manual air vent fitting to allow for coil venting. Valve core type vent fittings shall not be accepted.
d) All coils shall be copper tube with mechanically bonded aluminum fins and 0.016" tube wall thickness. Coils to be a maximum of 6 rows with 10 fins per inch.
e) 475 fpm maximum coil velocity at design airflow

2) Cooling Coil:
a) Indoor Refrigerant Coils: Comply with AHRI 210/240, and leak test to minimum 450 psig for a minimum 300-psig working pressure. Include thermal expansion valve. Match coil with associated condensing unit.
b) All coils shall be split row or intertwined configuration

b. Electric heating Coil:

1) Heater shall be duct mounted and finned tubular construction.
2) Voltage, physical size, wattage, number of steps and with accessories as noted on the drawings or specified. Heater shall be of design for mounting in a horizontal air flow through heater.

3) Resistance coils shall be fabricated of 80 percent nickel and 20 percent chromium wire, insulated by means of best quality ceramic terminal insulators and bushings from rigid, reinforced aluminized steel frame. Provide coil support brackets, reinforced with stiffening ribs and gussets, on maximum 4 inch centers. All coil terminals and fasteners shall be stainless steel.
4) Provide heaters with an automatic reset thermal cutout for primary protection installed in the control circuit and heat limiters installed in the power legs for secondary protection. Protection devices shall be serviceable through heater terminal box, without removing heater from duct.
5) Provide heater with integral terminal box, for making connections and enclosing accessories. Fabricate box from heavy gage aluminized steel, with a dust tight cover. Furnish continuous hinged type door, when fuses are installed in box. Provide insulated terminal boxes for installation in air-conditioning ducts running through warm, humid, non-conditioned spaces. All exposed surfaces shall be given a factory applied two coat baked enamel finish.
6) Air flow switch: Provide a remote airflow switch located downstream from heater, in the positive pressure ductwork, with an adjustable pressure range from 0.07 inch to 5.0 inch W.C. Switch shall be of the combined static and velocity pressure type.

D. Casing

1. Gauge: Single Wall Exterior: Minimum No. 18 USS sheet steel

2. Insulation

a. 1” thick, 1-1/2” lb density, foil faced, fiberglass insulation.
b. No insulation edges exposed.

3. Accessibility

a. Removable panels and insulated inspection doors to all internal parts.
b. Inspection Doors:
1) Exterior: Minimum No. 18 USS sheet steel.
2) Continuously gasketed perimeter.
3) Stainless or chrome plated steel hinges.
4) Latching handles.
c. Sections shall maintain structural integrity upon removal of panels.

E. Fan Section

1. Fan: Draw thru, double width, double inlet, forward curved, multi-blade centrifugal type, designed for low operating speeds

2. Fan Shaft: Factory coated with corrosion preventive compound

3. Shaft Bearings: Grease packed ball or sleeve type, sealed in self- aligning pillow blocks

4. Motor: Mounted internally or externally

a. Adjustable motor base
b. Direct drive motor

5. Vibration Isolation

    a. Internally Mounted Motor: Spring isolators by manufacturer
    b. Flexible connection between fan and casing

F. Condensate Drain Pan

1. Insulated double wall galvanized steel construction.

2. Sloped to drain connection.

3. Inspection door to allow for cleaning.

4. Separate drain pans for each tier of cooling coils.

G. Filter Section

1. Easy filter removal and replacement

2. Flat, V or Z pattern arrangement

3. Filter Type

    a. 2 inch MERV 8

H. Mixing Box

1. Combination filter and mixing box

2. Damper parallel multi-airfoil blades for:

    a. Control of outdoor and recirculated air
    b. Prevention of air stratification

3. Maximum damper leakage rate 20 cfm/sq ft @ 4.0 in wg

4. Damper bearings or bushings; stainless or nylon

5. Jamb and blade edge seals

I. Base Rail: Factory installed by manufacturer

1. Minimum 6 inch height (to elevate condensate drain)

2. Galvanized steel

3. Structurally capable of supporting unit on floor or by ceiling suspension

J. Controls –

1. Refer to equipment schedules and controls drawing for additional requirements.

2. Unit to be controlled from the building automation system.

3. Unit to have packaged self-contained controls to operate the blower coil unit, condensing unit and electric reheat coils. Controls shall be provided as part of the blower coil

package. Controls to be by the unit manufacturer or a pre-approved controls manufacturer.

a. Controls to have a set of alarm contacts. All wiring by M.C.
b. All control components to be rated for wet or damp locations and installed in NEMA 3 enclosures.
c. Controls system to be capable of the following:

1) Discharge air control – Control the unit to maintain a discharge air temperature of 55˚F (adj.).

2) Room level control – Control the unit based on a space temperature sensor provided with the unit.
3) Economizer control: Modulation of the return and outside air dampers to maintain discharge air and humidity setpoints.
4) Relief air damper: Open / close the relief air damper for relief air to leave the building.
5) Condensing unit – Operate the condensing unit.
6) Reheat coils – Modulate the reheat coil stages to maintain space temperature based on room thermostat temperatures.
7) Occupied / unoccupied control – Alter the space temperature set points depending on the space being occupied or unoccupied. Controls capable of seven (7) day programmable controls.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the Work of this Section in accordance with the manufacturer's printed instructions.

B. Comb all coils to repair bent fins.

C. During construction provide temporary closures of metal or taped polyethylene over openings into housing ducts to prevent dust from entering ductwork.

D. Seal all contractor installed penetrations airtight. Seal all openings prior to cleaning. Seal holes with proper SMACNA closures conforming to pressure class of the housing.

E. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

SECTION 23 8126
SPLIT SYSTEM HEAT PUMPS

PART 1 - GENERAL

1.1 SCOPE

A. Perform all Work required to provide and install the split system heat pump units indicated by the Contract Documents with supplementary items necessary for proper installation

B. Equipment Included in This Section

1. Split system heat pump 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. Color Samples: For unit cabinet, discharge grille, and exterior louver and for each color and texture specified.

C. Coordination Drawings: Plans, elevations, and other details, drawn to scale, using input from Installers of the items involved.

D. Field quality-control reports.

E. 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
7. Lennox

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, ACR 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. Filter: Return air shall be filtered by means of an easily removable washable filter. An optional MERV 8 filter shall be furnished

F. 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

5. Condensate Pump: Externally mounted, plenum rated pump.

G. 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.

H. 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

1. 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.

2. Equipment Included in This Section

3. Electric Terminal Heat
   a. Cabinet Unit Heaters

1.2 SUBMITTALS

1. Product Data: Catalog cuts, specifications, installation and maintenance instructions for each type of heater specified.

2. Schedule: List manufacturer, unit type, model number, and performance data for each unit heater.

1.3 QUALITY ASSURANCE

1. Regulatory Requirements: Heaters shall be UL listed.

2. 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

1. Special Tools: One (1) tool for each type and size vandal resistant fastener.

PART 2 - PRODUCTS

2.1 CONFIGURATION AND PERFORMANCE

1. Refer to the equipment schedules for additional configuration and performance requirements.

2.2 ELECTRIC TERMINAL HEAT

1. Electric Cabinet Unit Heaters

2. 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

3. 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.

4. 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.

5. Fan Assembly: Blow thru design.

   a. Fans: Forward curved centrifugal type, double width, statically and dynamically balanced, and directly connected to electric motor.

6. 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.

7. 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.

8. Refer to schedule for cabinet style, control type and electrical requirements for the unit.

PART 3 - EXECUTION

3.1 INSTALLATION

1. 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 #:

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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. 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.

B. 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.

C. 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 MAIN AND DISTRIBUTION PANELBOARDS

A. Panelboards: Circuit breaker type.

B. UL label “SUITABLE FOR USE AS SERVICE EQUIPMENT” where used as service equipment.

C. Enclosure: NEMA 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 cabinet front with hinged door with flush lock. 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 metal directory holders with clear plastic covers.

F. 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.

G. Circuit breakers shall be 125 VDC/240 AC rated for nominal 208Y/120V panels and 480Y/277V rated for nominal 480Y/277V panels. Minimum interrupting ratings shall be 10,000 amperes for 120/208V circuits and 14,000 amperes for 277/480V circuits, unless higher rating noted on the Contract Documents.

H. Molded Case Circuit Breakers: Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. 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.

I. Electronic Trip Circuit Breakers: Where indicated on the Drawings, provide circuit breakers with electronic trip unit. Adjustable settings may include long-time, short-time, instantaneous, and ground fault pick-up and delay.

J. Circuit breakers shall be bolt-on type with common trip handle for all poles. No handle ties of any sort will be approved.

K. Shunt trip breakers shall be provided where indicated.

L. Ground fault breakers shall be provided where indicated.

2.2 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.

B. Coordinate with Civil work as shown on Drawings for work under building slab.

1.03 SUMMARY

A. Section Includes:
   1. Preparing subgrades for slabs-on-grade.
   2. Excavating and backfilling for footings and foundations.

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. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. 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. 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.

F. Fill: Soil materials used to raise existing grades.

G. 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.

H. Subbase Course: Aggregate layer placed between the subgrade and interior slab on grade.

I. 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.

J. 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. 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.

H. 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.

I. Sand: ASTM C33/C33M; fine aggregate.

J. 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.

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.

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. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices or changes in the Work.

D. 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 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.

3.11 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, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95percent.
2. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.12 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.

3.13 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.

3.14 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