Renovations to
Midland County Administrative Services Building

Project Manual
November 11, 2024

ArchiVerde DESIGN LLC
ARCHITECTURE INTERIORS

SECTION 000101
PROJECT TITLE PAGE

PROJECT MANUAL
FOR
RENOVATIONS TO MIDLAND COUNTY ADMINISTRATIVE SERVICES BUILDING

OWNER:
THE COUNTY OF MIDLAND, MICHIGAN
2020 WEST ELLSWORTH STREET,
MIDLAND, MI 48640

ARCHITECT:
ARCHIVERDE DESGIN, LLC
2720 RODD STREET
MMIDLAND, MI 48640
ARCHITECT'S PROJECT NUMBER: 20220400

PROJECT LOCATION:
2020 WEST ELSWORTH STREET
MIDLAND, MICHIGAN 48640

DATE: NOVEMBER 11, 2024

PREPARED BY:
ARCHIVERDE DESIGN, LLC

END OF SECTION

This page intentionally left blank

SECTION 000103
PROJECT DIRECTORY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification of project team members and their contact information.

1.02 OWNER:

A. Name: The County of Midland, a Public Body Corporate
   Address: 220 W. Ellsworth Street.
   Midland, MI 48640.

B. Primary Contact: All correspondence from the Contractor to the Architect will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   Name: Kevin Beeson.
   Title: Facilities Manager
   Email: KBeeson@co.midland.mi.us.

1.03 CONSULTANTS:

A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Company Name: ArchiVerde Design, LLC
      Address: 2720 Rodd Street.
      Midland, MI 48640.
      Telephone: (989)835-6761.
   2. Primary Contact:
      a. Name: David L. Keyser, RA.
      b. Title: Architect/Owner
      c. Email: dave@archiverde.us.

B. Plumbing/Mechanical/Electrical Engineering Consultant
   1. Company Name: JLK Engineering.
      Address: 795 Fairway Drive.
      Gaylord, MI 49735.
      Telephone: (989)448-4631.
   2. Primary Contact:
      a. Name: Justin Kowatch, PE.
      b. Title: Principal Engineer
      c. Email: jkowatch@jlkengineering.com.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

This page intentionally left blank

SECTION 000110
TABLE OF CONTENTS

END OF SECTION

This page intentionally left blank

SECTION 000116
LIST OF DRAWINGS

GENERAL

G1.1 TITLE PAGE

ARCHITECTURAL DRAWINGS

D2.1 FIRST FLOOR DEMOLITION PLAN
D2.2 SECOND FLOOR DEMOLITION PLAN
D2.3 THIRD FLOOR DEMOLITION PLAN
A2.1 FIRST FLOOR PLAN
A2.2 SECOND FLOOR PLAN
A2.3 THIRD FLOOR PLAN
A3.1 FIRST FLOOR REFLECTED CEILING PLAN
A3.2 SECOND FLOOR REFLECTED CEILING PLAN
A3.3 THIRD FLOOR REFLECTED CEILING PLAN
A6.1 FIRST FLOOR FINISHES PLAN
A6.2 SECOND
A6.3 THIRD FLOOR FINISHES PLAN
A8.1 FIRST FLOOR INTERIOR ELEVATIONS
A8.2 SECOND FLOOR INTERIOR ELEVATIONS
A8.3 SECOND FLOOR INTERIOR ELEVATIONS
A8.4 THIRD FLOOR INTERIOR ELEVATIONS
A8.5 THIRD FLOOR INTERIOR ELEVATIONS
A9,1 FIRST FLOOR DOOR AND ROOM INFORMATION SCHEDULES
A9.2 SECOND FLOOR DOOR AND ROOM INFORMATION SCHEDULES
A9.3 THIRD FLOOR DOOR AND ROOM INFORMATION SCHEDULES
A9.4 INTERIOR DETAILS AND PARTITION TYPES
A9.5 INTERIOR DETAILS

PLUMBING DRAWINGS

P0.1 PLUMBING AND FIRE SUPPRESSION TITLE SHEET
P1.1 FIRST FLOOR PLUMBING PLAN - SANITARY DEMOLITION
P1.2 SECOND FLOOR PLUMBING PLA N - SANITARY DEMOLITION
P1.3 THIRD FLOOR PLUMBING PLAN - SANITARY DEMOLITION
P2.1 FIRST FLOOR PLUMBING PLAN - WATER AND FIRE SUPPRESSION DEMOLITION
P2.2 SECOND FLOOR PLUMBING PLAN - WATER AND FIRE SUPPRESSION DEMOLITION
P2.3 THIRD FLOOR PLUMBING PLAN - WATER AND FIRE SJUPPRESSION DEMOLITION
P3.1 FIRST FLOOR PLUMBING PLAN - SANITARY NEW WORK
P3.2 SECOND FLOOR PLUMBING PLAN - SANITARY NEW WORK
P3.3 THIRD FLOOR PLUMBING PLAN - SANITARY NEW WORK
P4.1 FIRST FLOOR PLUMBING PLAN - WATER AND FIRE SUPPRESSION NEW WORK
P4.2 SECOND FLOOR PLUMBING PLAN - WATER AND FIRE SUPPRESSION NEW WORK
P4.3 THIRD FLOOR PLUMBING PLAN - WATER AND FIRE SUPPRESSION NEW WORK

MECHANICAL DRAWINGS

M0.1	**MECHANICAL TITLE SHEET**
M1.1	**FIRST FLOOR MECHANICAL PLAN - PIPING DEMOLITION**
M1.2	**SECOND FLOOR MECHANICAL PLAN - PIPING DEMOLTION**
M1.3	**THIRD FLOOR MECHANCAL PLAN - PIPING DEMOLITION**
M2.1	**FIRST FLOOR MECHANICAL PLAN - SHEET METAL DEMOLTIION**
M2.2	**SECOND FLOOR MECHANICAL PLA N - SHEET METAL DEMOLTION**
M2.3	**THIRD FLOOR MECHANICAL PLAN - SHEET METAL DEMOLITION**
M3.1	**FIRST FLOOR MECHANICAL PLAN - PIPING NEW WORK**
M3.2	**SECOND FLOOR MECHANICA**
M3.3	**THIRD FLOOR MECHANICAL PLAN - PIPING NEW WORK**
M4.1	**FIRST FLOOR MECHANCIAL PLAN - SHEET METAL NEW WORK**
M4.2	**SECOND FLOOR MECHANICAL PLAN - SHEET METAL NEW WORK**
M4.3	**THIRD FLOOR MECHANICAL PLAN - SHEET METAL NEW WORK**
M5.1	**MECHANICAL DETAILS**
M5.2	**MECHANICAL DETAILS**
M5.3	**MECHANICAL DETAILS**
M5.4	**MECHANICAL DETAILS**
M5.5	**MECHANICAL DETAILS**

ELECTRICAL DRAWINGS

E0.1	**ELECTRIAL TITLE SHEET**
E1.1	**FIRST FLOOR ELECTRICAL PLAN - POWER DEMOLTION**
E1.2	**SECOND FLOOR ELECTRICAL PLAN - POWER DEMOLTION**
E1.3	**THIRD FLOOR ELECTRICAL PLAN - POWER DEMOLITION**
E2.1	**FIRST FLOOR ELECTRICAL PLAN - LIGHTING DEMOLITION**
E2.2	**SECOND FLOOR ELECTRICAL PLAN - LIGHTING DEMOLITION**
E2.3	**THIRD FLOOR ELECTRICAL PLAN - LIGHTING DEMOLITION**
E3.1	**FIRST FLOOR ELECTRICAL PLAN - POWER NEW WORK**
E3.2	**SECOND FLOOR ELECTRICAL PLAN - POWER NEW WORK**
E3.3	**THIRD FLOOR ELECTRICAL PLAN - POWER NEW WORK**
E4.1	**FIRST FLOOR ELECTRICAL PLAN - LIGHTING NEW WORK**
E4.2	**SECOND FLOOR ELECTRICAL PLAN - LIGHTING NEW WORK**
E4.3	**THIRD FLOOR ELECTRICAL PLAN - LIGHTING NEW WORK**
E5.1	**ELECTRICAL DETAILS**

END OF SECTION

SECTION 001113
ADVERTISEMENT FOR BIDS

FROM:

1.01 THE OWNER (HEREINAFTER REFERRED TO AS OWNER):

A. The County of Midland, Michigan, Pubilc Body Corp

B. Address:
220 West Ellsworth Street
Midland, MI, 48640

1.02 AND THE ARCHITECT (HEREINAFTER REFERRED TO AS ARCHITECT):

A. ArchiVerde Design, LLC

B. Address:
2720 Rodd Street
Midland, MI 48640

1.03 DATE: NOVEMBER 11, 2024

1.04 TO: POTENTIAL BIDDERS

A. Your firm is invited to submit an offer under seal to Owner for renovation of a facility located at the above address before 10:00 AM am local standard time on Thursday, the fifth day of December, 2024, for:

B. Project: Renovations To Midland County Administrative Services Building

C. Architect's Project Number: 20220400.

D. Bid Documents may be downloaded from the web site: www.archiverde.us/Midland_County

E. Bidders will be required to provide Bid security in the form of a Bid Bond of a sum no less than 5 percent of the Bid Amount or a certified check in the amount of 5 percent of the base bid.

F. Refer to other bidding requirements described in Document 002113 - Instructions to Bidders and Document 003100 - Available Project Information.

G. Submit your offer on the Bid Form provided. Bidders may supplement this form as appropriate.

H. Your offer will be required to be submitted under a condition of irrevocability for a period of 30 days after submission.

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

END OF SECTION

This page intentionally left blank

SECTION 002113
INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 THE INSTRUCTIONS IN THIS DOCUMENT AMEND OR SUPPLEMENT THE INSTRUCTIONS TO BIDDERS AND OTHER PROVISIONS OF THE BIDDING AND CONTRACT DOCUMENTS.

1.02 DOCUMENT INCLUDES

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

B. Bid Documents and Contract Documents
   1. Definitions
   2. Contract Documents Identification
   3. Availability
   4. Examination
   5. Inquiries/Addenda
   6. Product/Assembly/System Substitutions

C. Site Assessment
   1. Site Examination
   2. Prebid Conference

D. Qualifications
   1. Prequalification

E. Bid Submission
   1. Submission Procedure

F. Bid Enclosures/Requirements
   1. Performance Assurance
   2. Insurance
   3. Bid Form Requirements
   4. Fees for Changes in the Work
   5. Bid Form Signature
   6. Additional Bid Information

1.03 RELATED DOCUMENTS

A. Document 011000 - Summary.

B. Document 001113 - Advertisement for Bids.

C. Document 003100 - Available Project Information.

D. Document 004100 - Bid Form.

E. Document 004336 - Proposed Subcontractors Form.

F. Document 004325 - Substitution Request Form - During Procurement

G. Document 004373 - Proposed Schedule of Values Form.

H. Document 007300 - Supplementary Conditions:

I. Document 005210-Addendum to the Agreement Form

INVITATION

2.01 BID SUBMISSION

A. Bids signed and under seal, executed, and dated will be received at the office of the Denise Mason, Procurements and Contracts Administrator, 3rd Floor Finance Department at 220 West Ellsworth Street, Midland, MI 48640 before 10:00 a.m. local standard time on Thursday, December 5, 2024.

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

C. Submit required Supplements To Bid Forms within 24 hours after closing time for receiving bids.

D. Offers will be opened publicly at 10:05 AM, on December 5, 2024, after the time for receipt of bids.

E. Amendments to the submitted offer will be permitted if received in writing prior to bid closing and if endorsed by the same party or parties who signed and sealed the offer.

2.02 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete project named Renovations To Midland County Administrative Services Building Renovation for a Stipulated Sum contract, in accordance with Contract Documents.

2.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises remodeling and renovation, including general construction, mechanical, and electrical Work.

B. Project Location:
   Midland County Administrative Services Building.
   220 West Ellsworth Street.
   Midland, Michigan 48640.

2.04 CONTRACT TIME

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

B. Owner requires that under the work of this contract be completed as quickly as possible and consideration will be given to time of completion when reviewing the submitted bids.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

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

B. Contract Documents: Defined in Section 005200 - Agreement Form and Section 005210 - Addendum to the Agreement Form including issued Addenda.

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

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

3.02 CONTRACT DOCUMENTS IDENTIFICATION

A. Contract Documents are identified as Architect's Project Number 20220400, as prepared by Architect, and with contents as identified in the Project Manual.

3.03 AVAILABILITY

A. Bid documents may be obtained at www.archiverde.us/Midland_County

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. Direct questions to the Architect, email; dave@archiverde.us.

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

C. Verbal answers are not binding on any party.

D. Clarifications requested by bidders must be in writing 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 known recipients.

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.

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 in Section 004325; 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.

B. A visit to the project site has been arranged for bidders as follows: A prebid walk-through has been scheduled for 9 AM (EST) on Tuesday, November 19, 2024. The walk-through shall commence in the lobby (atrium) of the Midland County Administrative Services Building, 220 West Ellsworth Street, Midland MI 48640.
   1. Subsequent to the walk-through, the currently occupied premises at the project site will be available for examination by bidders only upon appointment with, and accompaneid by, the Owner's representative.

QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS

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

5.02 SUBCONTRACTORS/SUPPLIERS/OTHERS

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

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.

D. An abstract summary of submitted bids will be made available to all bidders following bid opening.

6.02 BID INELIGIBILITY

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

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

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

BID ENCLOSURES/REQUIREMENTS

7.01 SECURITY DEPOSIT

A. Bids shall be accompanied by a security deposit as follows:
   1. Bid Bond of a sum no less than 5 percent of the Bid Amount on AIA A310 Bid Bond Form.
   2. Certified check in the amount of 5% of the Base Bid.

B. Endorse the Bid Bond in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.

C. Endorse the certified check in the name of the Owner.

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

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

F. After a bid has been accepted, all securities will be returned to the respective bidders and other requested enclosures.

G. If no contract is awarded, all security deposits will be returned.

7.02 PERFORMANCE ASSURANCE

A. Accepted Bidder: Provide a Performance Bond as described in 005210 - Addendum to the Agreement Form.

B. Include the cost of performance assurance bonds in the Bid Amount.

7.03 INSURANCE

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

7.04 BID FORM REQUIREMENTS

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

B. Taxes: Refer to Document 005210 - Addendum to the Agreement Form for inclusion of taxes, procedures for tax rebate claims, and products that are tax exempt.

7.05 FEES FOR CHANGES IN THE WORK

A. Overhead and profit for changes in the work shall be limited to 15% total.Include the fees for overhead and profit on own Work and Work by subcontractors, identified in Supplementary Conditions.

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. Preliminary Project Schedule in horizontal bar chart form. Refer to Section 013216 - Construction Progress Schedule
   2. Written request for subsittution.
      a. Comply with the requirements of Section 012500 - Substitution Procedures

B. Submit the following Supplements 24 hours after bid submission:
   1. AIA Document G705-2001 "List of Proposed Subcontractors"
   2. AIA Document G703-1992 "Continuation Sheet with Proposed Schedule of Values:

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

This page intentionally left blank

SECTION 004100
BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Owner

The County of Midland, Michigan, Public Body Corporate
220 West Ellsworth Street
Midland, Michigan 48640

1.02 FOR:

A. Project: Renovations To Midland County Administrative Services Building

B. Architect's Project Number: 20220400
220 W. Ellsworth Street
Midland, Michigan 48640

1.03 DATE: _____ (BIDDER TO ENTER DATE)

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

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

1.05 OFFER

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

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

1.06 ACCEPTANCE

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

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

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. Complete the Work in _____ calendar weeks from Notice to Proceed. (Bidder to enter number of weeks.)

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.

Addendum # _____ Dated _____.
Addendum # _____ Dated _____.
Addendum # _____ Dated _____.
Addendum # _____ Dated _____.
Addendum # _____ Dated _____.

1.10 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. (Authorized signing officer, Title)

G. (Seal)

H. _____

I. (Authorized signing officer, Title)

1.11 IF THE BID IS A JOINT VENTURE OR PARTNERSHIP, ADD ADDITIONAL FORMS OF EXECUTION FOR EACH MEMBER OF THE JOINT VENTURE IN THE APPROPRIATE FORM OR FORMS AS ABOVE.

END OF SECTION

SECTION 005200
AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

A. The "Standard Short Form of Agreement Between Owner and Contractor" AIA Document A105-2017, is the agreement form for this contract with the Owner's amendments.

1.02 RELATED REQUIREMENTS

A. Section 005210 - Addendum to the Agreement Form

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

This page intentionally left blank

SECTION 005210
ADDENDUM TO THE AGREEMENT FORM

PART 1 GENERAL

1.01 SUMMARY

A. The following Addendum revises the Standard Short Form Agreement Between Owner and Contractor AIA Document A105-2017, by and between the County of Midland, MIchigan, Public Body Corporate, and the Contractor.

B. Where an Article, Section, Paragraph, Subparagraph, or Clause contained in the Stand Form is revised by the provisions of this Addendum, the unaltered provisions of that Article, Section, Paragraph, Subparagraph, or Clause shall remain in effect. The terms of this Addendum supersede the terms of the Standard Form, including any other addenda or any exhibits, appendices and other attachments thereto.

C. In the event there is a conflict of terms of this Addendum and the terms of the Standard Form, including any other addenda or any exhibits, appendices, and other attachments thereto, the terms of this Addendum shall govern, control, and prevail.

1.02 RELATED SECTIONS

A. Section 005200 - Agreement Form

1.03 MODIFICATI0NS TO THE AGREEMENT FORM

A. ARTICLE 1. THE CONTRACT DOCUMENTS
   1. Insert the following at the end of Article 1:
      a. In the event inconsistencies, conflicts, or ambiguities between or among the Contract Documents, the Contract Documents shall take precedence in the following order:
         1) Any written amendments, in order of the most recent executed
         2) Addenda
         3) Supplemental Conditions, if any
         4) The Agreement
         5) Drawings and Specifications (including the final drawings for the Project prepared by the Owner's Architect. The drawings and specifications comprising the Construction Documents are complementary. Anything shown in any drawings and not mentioned in the specifications, or mentioned in any of the specifications and not shown in the drawings, shall have the same effect as if shown or mentioned in both. Likewise, if the drawings call for a greater quantity or higher quality than the specifications, or if the specifications call for a greater quantity or higher quality than the drawings, then the greater quantity or higher quality, resulting in the most favorable interpretation to Owner, shall prevail.

B. ARTICLE 4 PAYMENTS
   1. Insert the following after Section 4.2
      a. "No interest shall be owed or paid by the Owner"

C. ARTICLE 5 INSURANCE
   1. In Article 5 delete Section 5.1.1; 5.1.2; 5.1.3; 5.1.4; and 5.1.5 and add the following:
      a. Contractor’s Insurance
         1) The limits of liability for the insurance required by the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. WORKERS COMPENSATION	MINIMUM LIMITS (000's)
Part One: Compensation	Statutory
Part Two: Employee’s Liability	
Accident	$100
Disease	$100
Aggregate Disease	$500

2. GENERAL LIABILITY

Bodily Injury-Each Occurrence Limit	$1,000
Bodily Injury-Aggregate Limit	$2,000
Property Damage-Each Occurrence Limit	$1,000
Property Damage-Aggregate Limit	$2,000
Products Completed Operations Aggregate Limit	$1,000

OR

Combined Single Limit/Each Occurrence Limit	$1,000
Combined Single Limit/Aggregate Limit	$1,000

3. COMPREHENSIVE AUTOMOBILE LIABILITY

Bodily Injury Each Occurrence Limit	$2,000
Property Damage Each Occurrence Limit	$100 OR
Combined Single Limit	$3,000
No Fault	Statutory

4. OWNER'S AND CONTRACTORS PROTECTIVE LIABILITY

Bodily Injury Each Occurrence	$1,000
Property Damage Each Occurrence Limit	$500
Property Damage Aggregate Limit	$1,000

OR

Combined Single Limit	$2,500

5. UMBRELLA or EXCESS LIABILITY

The Owner's and Contractor's Protective Liability Insurance shall include the following persons or entities as insureds:

(a) Contractor
(b) Owner
(c) Architect

6. The Contractor may provide limits of liability by a combination of the above described policy forms and an Umbrella Excess Liability Policy.

7. Such policy shall not exclude coverage for:

Injury to or destruction of any property arising out of the collapse of, or structural injury to any building or structure due to grading of land, excavation, burrowing, filling, tunneling, pile driving, cofferdam work, or caisson work.

8. Contractor shall not commence work at the site under the Contract until he has obtained all insurance required hereunder, certificates of such insurance have been filed with the Owner and such insurance has been

approved by the Owner.

9. The Contractor shall not allow any Subcontractor to commence work until all insurance required hereunder and certificates for which insurance has been obtained and approved by the Owner. Approval of the insurance of the Owner shall not relieve or decrease the liability of the Contractor hereunder.

   Insurance policy shall have a waiver of subrogation endorsement in favor of Owner and Architect.

D. ARTICLE 6 GENERAL PROVISIONS
   1. Delete Section 6.1 and replace it with the following:
      a. The Contract, Architect Drawings, Architect Addend, if any, and the Owner's Addenda collectively represent the entire and integrated agreement between the parties and supersedes prior negotiation, representations or agreements, either written or oral. The
      b. Contract may be amended or modified only by a written modification in accordance with Article 10.

E. ARTICLE 7. OWNER
   1. After the first sentence in Section 7.1.1, add the following language:
      a. "Information or services under the Owner’s control shall be furnished by the Owner with reasonable promptness. The Owner shall not be responsible for any delay in orderly progress of the Work resulting from a lack of information or services not requested reasonably enough in advance of the date needed or not under the Owner’s exclusive control."
   2. Delete Section 7.1.3 in its entirety.
   3. Delete Section 7.3 and replace it with the following:
      a. "If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a five-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case, the Owner may deduct from payments then or thereafter due to Contractor the cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. If future payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner."

F. ARTICLE 8 CONTRACTOR
   1. At Section 8.5 Warranty, after the last sentence of the paragraph add the following:
      a. "The Contractor hereby warrants that all Work performed and material furnished hereunder shall be free of defects for a period of one year from the Owner's final acceptance of all work performed."
   2. Delete Section 8.6 in its entirety and replace it with the following:
      a. Taxes.
      b. .1 The Contractor shall pay all applicable taxes upon labor and materials entering into the Work or portions thereof provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect. It is understood that the Contract Sum includes all taxes and assessments applicable to the Work".
      c. .2 Contractor shall be responsible for informing itself of tax laws, requirements, regulations and interpretations as they apply to this Project. The specific tax

information provided herein is given as a convenience to the Contractor. The Project is solely owned by the

d. .3 The Contractor shall keep accurate and detailed records itemizing all taxes assessed or paid on all purchases of materials and shall include with each payment application under the Contract signed statements of such tax records and written verification that each such tax amount set forth in the record has been paid or levied."

3. Delete Section 8.7.2 and replace it with the following:
   a. .2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work including, but not limited to, compliance with all applicable local permit requirements and fee schedules."
4. At Section 8.9 Use of Site, add the following to the end of the section:
   a. "The Contractor is responsible for securing the construction materials and equipment on-site. The Owner is not responsible for loss, theft, or damage of construction materials or equipment owned or procured by the Contractor or its agents for the Project."

G. ARTICLE 9 ARCHITECT
1. At Section 9.7, delete the words "and decide" after the word "interpret".
2. At Section 9.8, delete the words "and decisions" after the word "interpretations" in the first and second sentences of the section.
3. At Section 9.9, delete the word "Contractor" between the word's "Owner" and "Architect" in the first sentence of the section.

H. ARTICLE 10 CHANGES IN THE WORK
1. At Section 10.2, add the words "after consultation with the Owner," after the word Work in the first sentence of the section.

I. ARTICLE 11 TIME
1. Delete Section 11.2 and replace it with the following:
   a. "The Owner shall have the right, without giving the Contractor the right to any extra compensation, at any time when, in the judgment of the Owner, the Work is not proceeding in accordance with the approved progress schedule, to require the Contractor to take such measures or adopt such methods as may be necessary in the Owner's opinion to obtain and
   b. maintain satisfactory progress, but the failure of the Owner to demand that the Contractor adopt such measures shall not relieve the Contractor of his obligation to secure the rate of progress necessary to complete the Work within the time required by the Contract."
2. Add new Section 11.4 as follows:
   a. The Contractor agrees to make no claim for damages for delay in the performance of this Contract occasioned by any act or omission of the Owner or any of his Representatives and agrees that any subject claim shall be fully compensated for by only an extension of time to complete the performance of the work as provided herein. If the Contractor is delayed at any time in the progress of the Work by any cause, which the Owner determines may justify the delay, including but not limited to, unforeseeable cause beyond the control and without the fault or negligence of the Contractor, its agents and employees, including but not restricted to: acts of God, acts of the public enemy, acts of the Owner, act of another Contractor in performance of a Contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather over the entire Contract Time, then the Contract Time may be extended by Change Order for such reasonable-time shall relieve the Contractor from any obligation attendant upon him under any of the provisions of this Contract. It is expressly agreed that the Owner's liability for delay from any cause shall be limited to granting a time extension to the Contractor and there is no other obligation, express or implied, on the part of the Owner to the Contractor for delay from any cause."

b. "The Owner and the Contractor understand and agree that the time limits stated in the Contract Documents are of the essence of this Agreement and any delay in achieving Substantial Completion within the Contract Time will result in damages to the Owner, including but not limited to, damages from a loss of use and a loss of profits and other direct, consequential and special damages.

The parties agree that the amount of said damages is and will be impossible to determine. Accordingly, in the event of any delay, except as may be expressly excused hereunder, the Contractor shall be liable to the Owner for the payment of liquidated damages in the amount calculated using the formula included in Section 2.3 or of One Thousand Dollars ($1,000.00) for each calendar day of delay for each day or partial day whichever is greater, until Substantial Completion is achieved. The Owner shall make a deduction of the liquidated damage amount from the next payment amount owed to the Contractor after the delay and for each subsequent payment owed to the Contractor for any delay thereafter. The obligation to pay, or payment of any such liquidated damages hereunder shall not limit Owner's right to terminate this Agreement as provided herein, including but not limited to termination for cause.

The Contractor shall not be excused from its obligation to achieve Substantial Completion within the Contract Time except when the Contractor is delayed in the progress of the Work by events, other than the lack of funds, which are wholly beyond the control of the Contractor and not foreseeable, which events are limited to the following: 1) acts of God or weather delays not caused by Contractor; 2) fire, explosion or other casualty which are not proximately caused by any acts or omissions of the Contractor; 3) labor strikes or disputes which could not have been averted through good faith negotiations and/or reasonable compromise by the Contractor; 4) civil unrest; 5) Change Orders that expressly extend the Contract Time; 6) unforeseeable delays in the delivery of essential supplies or equipment despite all reasonable efforts at procurement by the Contractor and the unavailability of suitable supplies or equipment from another supplier; 7) Owner's failure to give written notice of approval or disapproval of any drawings, plans, specifications or other items requiring such approval, within the time provided in the contract documents, or other delays wrongly caused by Owner; and 8) future orders by any court or regulatory agency having jurisdiction over this Project and the parties in Indian Country. In order to be entitled to such excuse for delay in achieving Substantial Completion, the Contractor shall give prompt notice to the Owner of any event which would foreseeably cause such delay. Any delay by the Contractor in achieving Substantial Completion that may be excused as provided herein shall be excused only for the duration of the event and only to the extent that the performance is specifically prevented by the event."

J. ARTICLE 15 MISCELLANEOUS PROVISIONS

K. ARTICLE 16 TERMINATION OF THE CONTRACT

1. At Section 16.1 replace "14" with "21" before the word "days"; and replace the word "seven" with "14" before the words "additional days in the first sentence.
2. At Section 16.2.1.3 delete the word "repeatedly" before the word "disregards".
3. At Section 16.2.2 delete the words "employment of the Contractor and may" after the word "terminate" in the the third line of the paragraph and insert the words "the Contract and may" after the word "terminate".
4. At Section 1.6.3, add the word "properly" before the word "executed" in the second sentence of the section.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Renovations To Midland County Administrative Services Building Renovation

B. Owner's Name: The County of Midland, Michigan, Public Body Corporate

C. Architect's Name: ArchiVerde Design, LLC

D. Additional Project contact information is specified in Section 000103 - Project Directory.

E. The Project consists of the alteration of the second floor of the Midland County Administrative Services Building.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 005200 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of alterations work is indicated on drawings.

B. Plumbing: Alter existing system and add new construction, keeping existing in operation.

C. HVAC: Alter existing system and add new construction, keeping existing in operation.

D. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.

E. Fire Suppression Sprinklers: Alter existing system and add new construction, keeping existing in operation.

F. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.

G. Owner will remove the following items before start of work:
   1. Furniture.
   2. Computer and IT equipment.

H. Contractor is required to remove and store the following prior to start of work, for later reinstallation by Contractor:
   1. Existing solid oak doors.

1.04 WORK BY OWNER

A. Owner will supply and install the following:
   1. Furniture.
   2. Computers and IT equipment.
   3. Security system.

1.05 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

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

C. Owner intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.

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

E. Schedule the Work to accommodate Owner occupancy.

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 site and premises by the public.

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

D. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Limit shutdown of utility services to ____ hours at a time, arranged at least 24 hours in advance with Owner.
   4. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

A. Construct Work in phases during the construction period:
   1. Attached to this section is a preliminay proposed phasing schedule of work in this project. Once the contract is awarded, the Contractor will work with the Owner to make any necessary modifications to this phasing schedule as required to allow the Onwer to maintain operations while providign the most efficent project sequencing. The Contactor shall include this phasing in the project schedule.
      a. Work in the Health Department (2nd floor, phase 2 and Phase 3), shall occur between March 1 and August 1.

B. Coordinate construction schedule and operations with Owner.

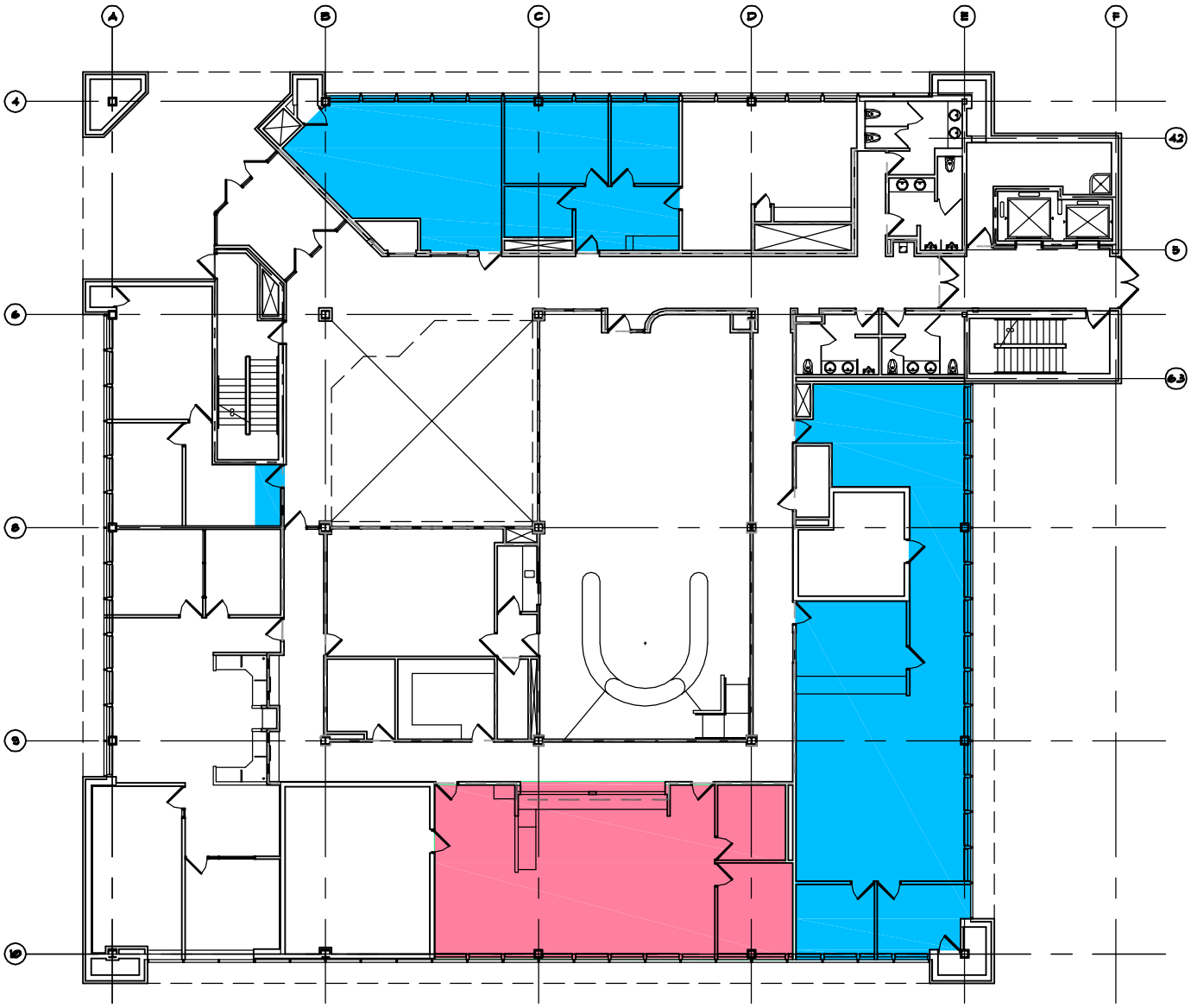
1.08 SPECIFICATION SECTIONS APPLICABLE TO EVERY CONTRACT

A. Unless otherwise noted, provisions of the sections listed below apply to every contract. Specific items of work listed under individual contract descriptions constitute exceptions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION



FIRST FLOOR PLAN PHASING - EXISTING

PHASE 1

PHASE 3

PHASE 2

PHASE 4

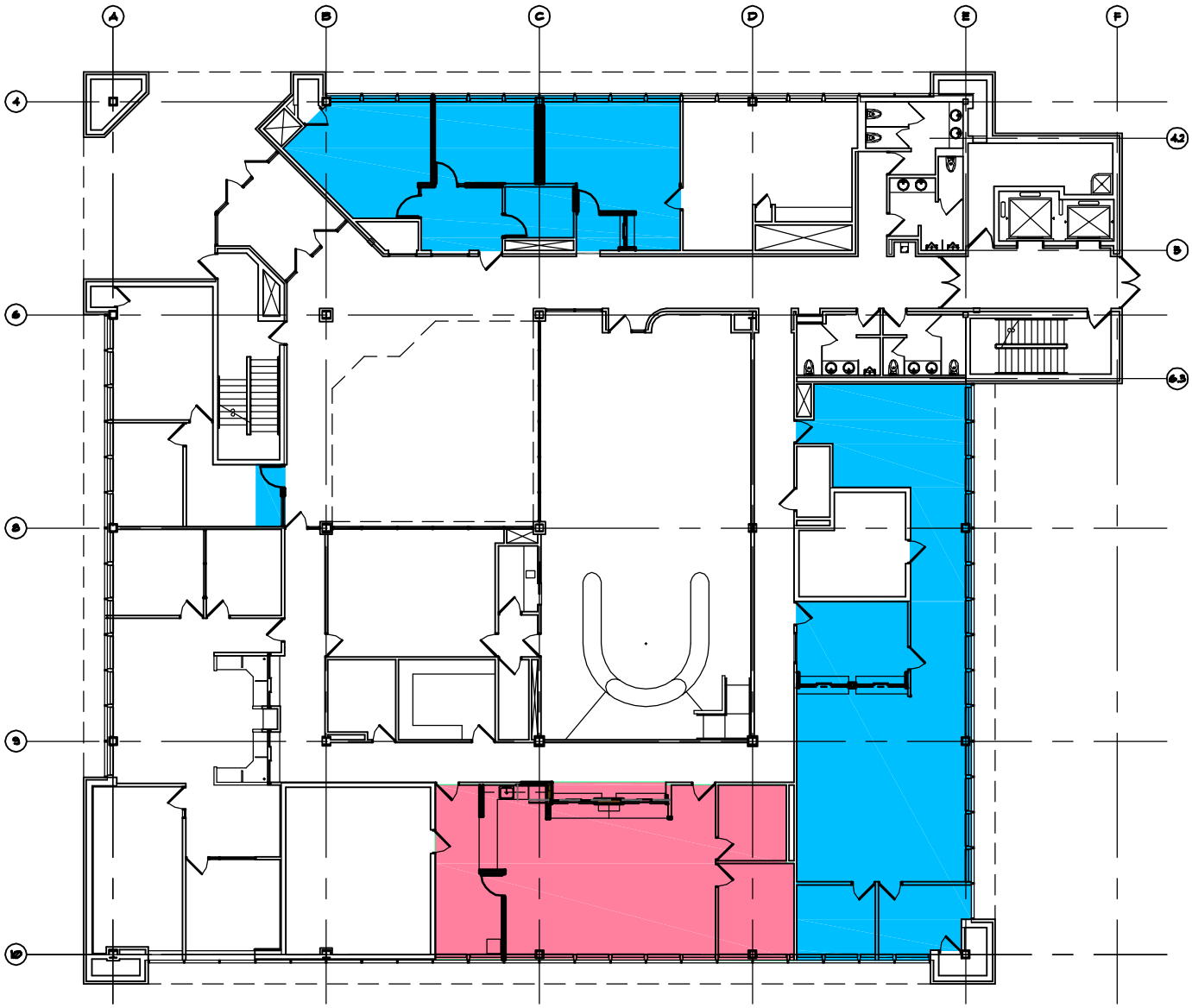
ArchiVerde DESIGN LLC
ARCHITECTURE INTERIORS
2014 N. Saginaw Rd. Midland, MI 48640
Phone: (989)835-6761

PROJECT: MIDLAND COUNTY ADMIN. SERVICES BUILDING
PROJ. NO.: 20220400 DRAWING: N/A
DATE: November 11, 2024 SCALE: N/A

PHASING

PH-1

This page intentionally left blank



FIRST FLOOR PLAN PHASING - PROPOSED

PHASE 1

PHASE 3

PHASE 2

PHASE 4

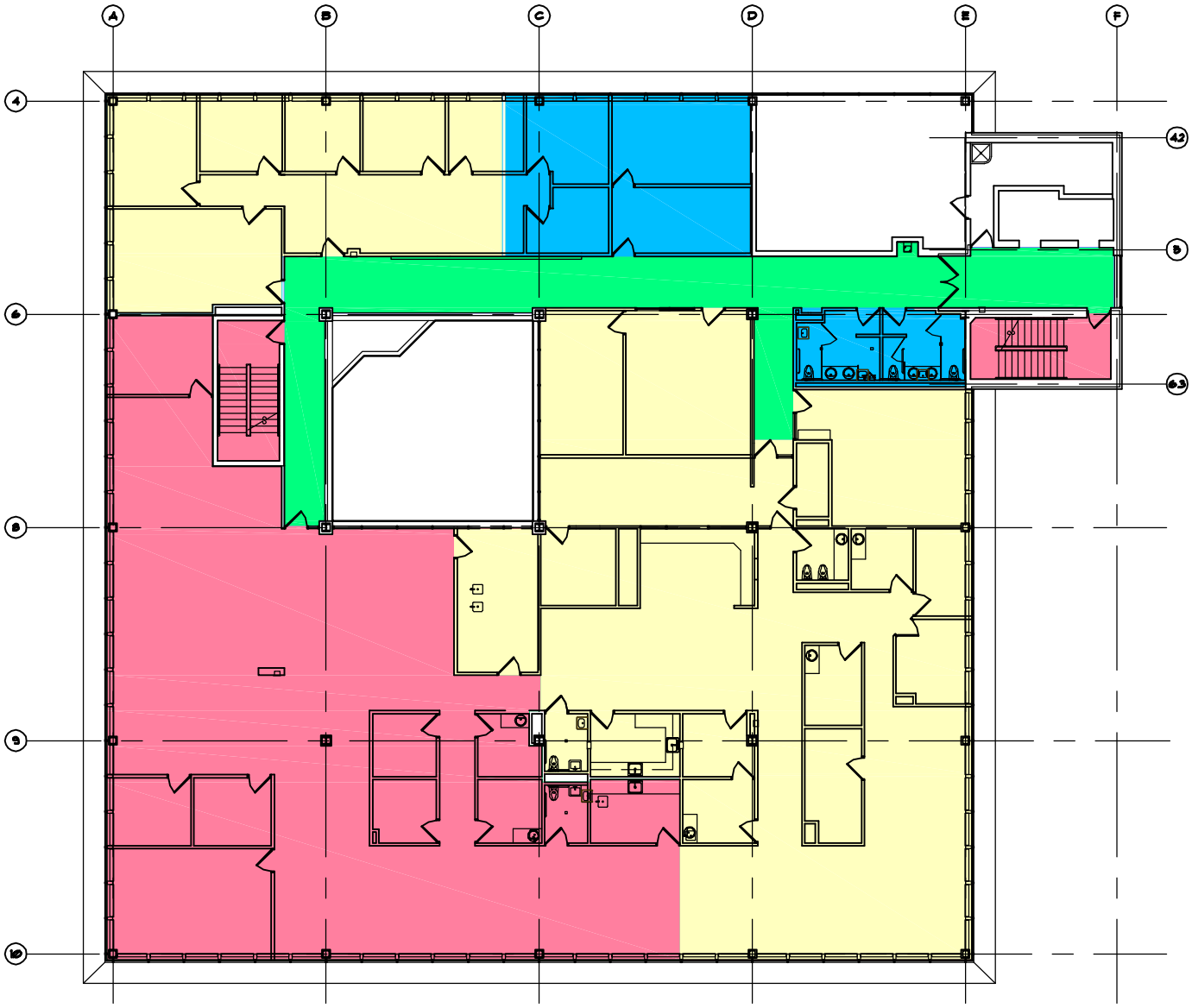
ArchiVerde DESIGN LLC
ARCHITECTURE INTERIORS
2014 N. Saginaw Rd. Midland, MI 48640
Phone: (989)835-6761

PROJECT: MIDLAND COUNTY ADMIN. SERVICES BUILDING
PROJ. NO.: 20220400 DRAWING: N/A
DATE: November 11, 2024 SCALE: N/A

PHASING

PH-2

This page intentionally left blank



SECOND FLOOR PLAN PHASING - EXISTING

PHASE 1

PHASE 3

PHASE 2

PHASE 4

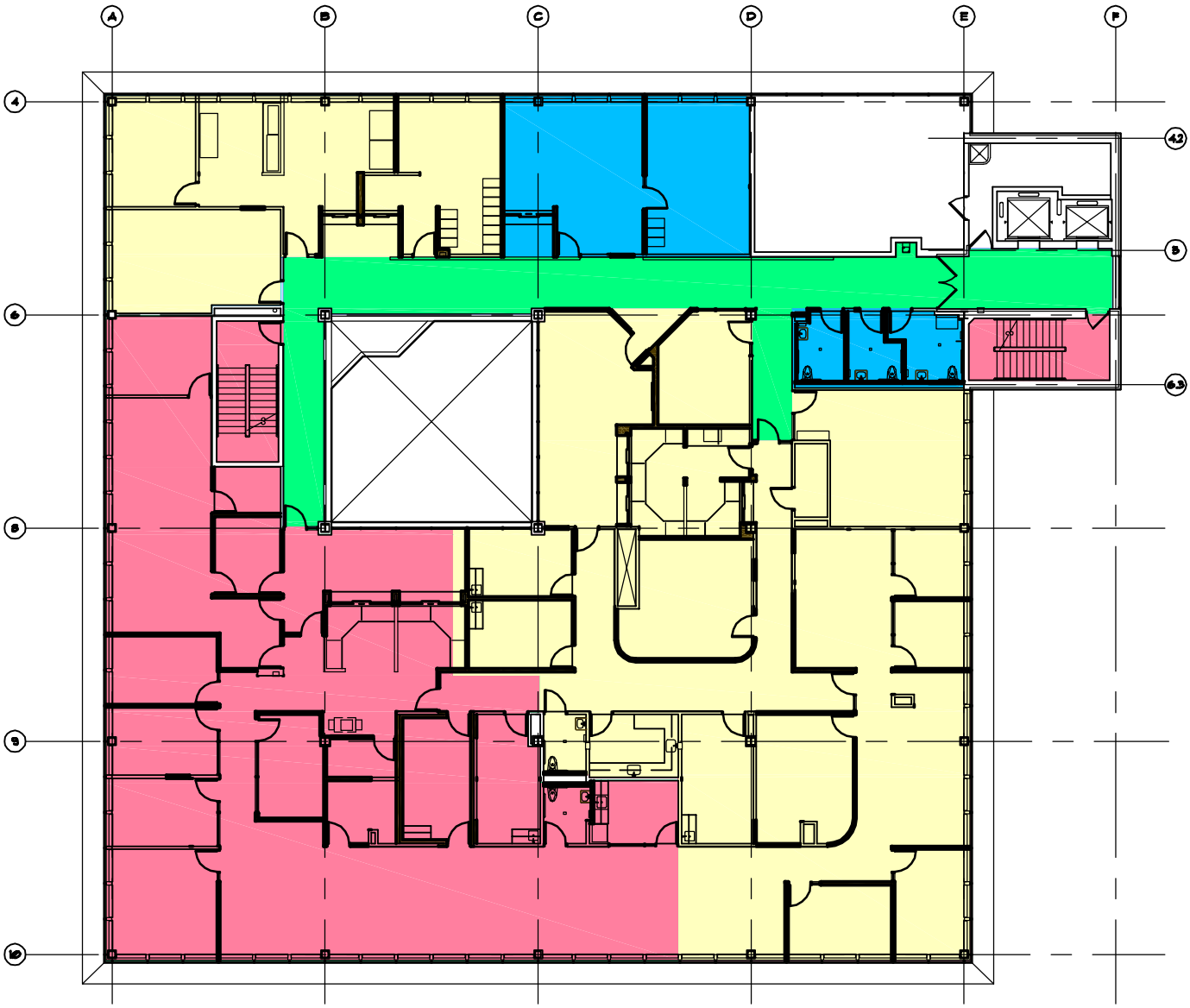
ArchiVerde DESIGN LLC
ARCHITECTURE INTERIORS
2014 N. Saginaw Rd. Midland, MI 48640
Phone: (989)835-6761

PROJECT: MIDLAND COUNTY ADMIN. SERVICES BUILDING
PROJ. NO.: 20220400 DRAWING: N/A
DATE: November 11, 2024 SCALE: N/A

PHASING

PH-3

This page intentionally left blank



SECOND FLOOR PLAN PHASING - PROPOSED

PHASE 1

PHASE 3

PHASE 2

PHASE 4

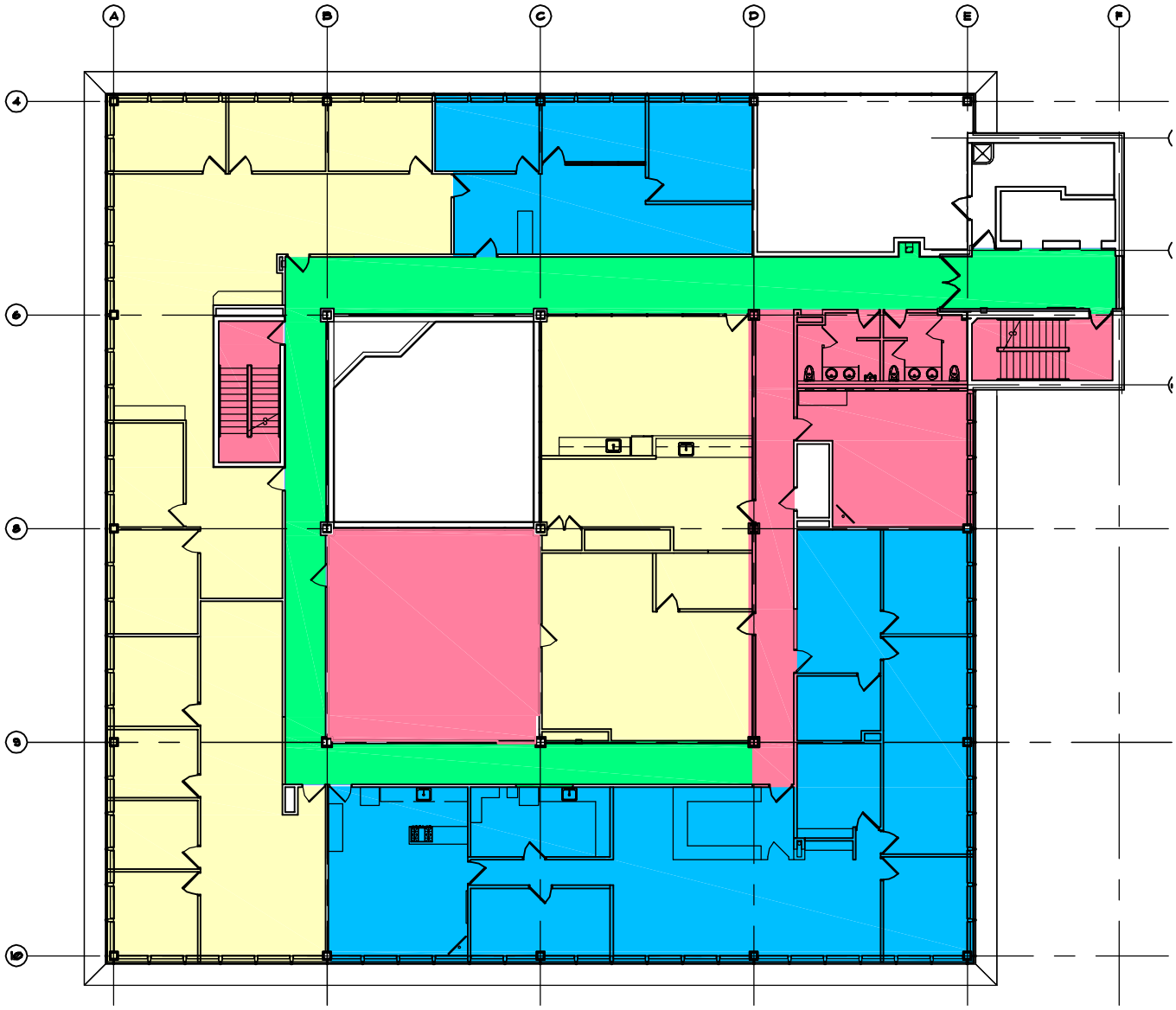
ArchiVerde DESIGN LLC
ARCHITECTURE INTERIORS
2014 N. Saginaw Rd. Midland, MI 48640
Phone: (989)835-6761

PROJECT: MIDLAND COUNTY ADMIN. SERVICES BUILDING
PROJ. NO.: 20220400 DRAWING: N/A
DATE: November 11, 2024 SCALE: N/A

PHASING

PH-4

This page intentionally left blank



THRID FLOOR PLAN PHASING - EXISTING

PHASE 1

PHASE 3

PHASE 2

PHASE 4

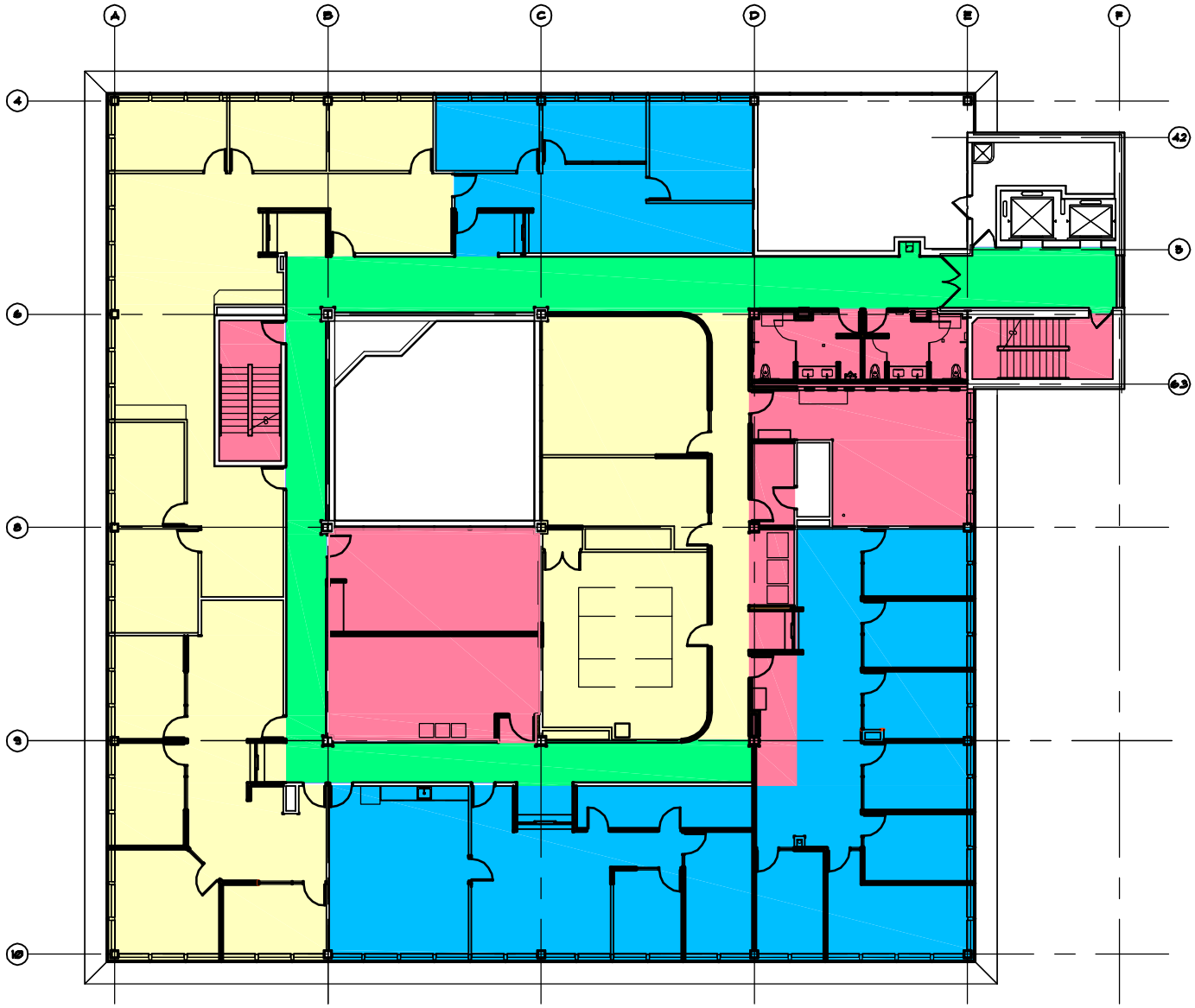
ArchiVerde
DESIGN LLC
ARCHITECTURE INTERIORS
2014 N. Saginaw Rd. Midland, MI 48640
Phone: (989)835-6761

PROJECT: MIDLAND COUNTY ADMIN. SERVICES BUILDING
PROJ. NO.: 20220400 DRAWING: N/A
DATE: November 11, 2024 SCALE: N/A

PHASING

PH-5

This page intentionally left blank



THIRD FLOOR PLAN PHASING - PROPOSED

PHASE 1

PHASE 3

PHASE 2

PHASE 4

ArchiVerde DESIGN LLC
ARCHITECTURE INTERIORS
2014 N. Saginaw Rd. Midland, MI 48640
Phone: (989)835-6761

PROJECT: MIDLAND COUNTY ADMIN. SERVICES BUILDING
PROJ. NO.: 20220400 DRAWING: N/A
DATE: November 11, 2024 SCALE: N/A

PHASING

PH-6

This page intentionally left blank

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 005200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.

B. Section 005210 - Addendum to the Agreement Form

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. 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. Execute certification by signature of authorized officer.

F. Submit one electronic and three hard-copies of each Application for Payment.

G. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 013000.
   2. Construction progress schedule, revised and current as specified in Section 013000.
   3. Partial release of liens from major subcontractors and vendors.
   4. Affidavits attesting to off-site stored products.

H. 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 ____ days.

D. 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 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.

E. 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. Time records and wage rates paid.

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

G. 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.

H. 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.

I. 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 017000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

1.02 RELATED REQUIREMENTS

A. Document 002113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.03 ACCEPTANCE OF ALTERNATES

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1:
   1. Provide an alternate price for providing all new factory finished doors in liew of refinishing exist doors to remain and salvaging and reinstalling existing doors in new locations. wood veneer of new doors shall be "rift sawn" red oak in lieu of "plain sliced to match existing" as specivied in section 081416 "Flush Wood Doors".

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

This page intentionally left blank

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 002113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

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

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

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, Architect's, and Contractor's names.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.
         3) Issue date.
         4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         5) Description of Substitution.
         6) Reason why the specified item cannot be provided.

7) Differences between proposed substitution and specified item.
8) Description of how proposed substitution affects other parts of work.

c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
1) Physical characteristics.
2) In-service performance.
3) Expected durability.
4) Visual effect.
5) Sustainable design features.
6) Warranties.
7) Other salient features and requirements.
8) Include, as appropriate or requested, the following types of documentation:
(a) Product Data:
(b) Samples.
(c) Certificates, test, reports or similar qualification data.
(d) Drawings, when required to show impact on adjacent construction elements.

d. Impact of Substitution:
1) Savings to Owner for accepting substitution.
2) Change to Contract Time due to accepting substitution.

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

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
1. Section 002113 - Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Architect will consider requests for substitutions only within 15 days after date of Agreement.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

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

D. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

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

B. Architect will notify Contractor in writing of decision to accept or reject request.

3.05 ACCEPTANCE

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

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

END OF SECTION

This page intentionally left blank

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Contractor's daily reports.

F. Coordination drawings.

G. Requests for Interpretation (RFI) procedures.

H. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: General product requirements.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - 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. Schedule 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, Owner and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

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

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's superintendent.
   5. 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. Review of RFIs log and status of responses.
   7. Review of off-site fabrication and delivery schedules.
   8. Maintenance of progress schedule.
   9. Corrective measures to regain projected schedules.
   10. Planned progress during succeeding work period.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.
   13. Other business relating to work.

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

3.03 CONSTRUCTION PROGRESS SCHEDULE

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

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

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

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

E. Submit updated schedule with each Application for Payment.

3.04 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
   1. Date.
   2. High and low temperatures, and general weather conditions.
   3. List of subcontractors at Project site.
   4. List of separate contractors at Project site.

5. Material deliveries.
6. Safety, environmental, or industrial relations incidents.
7. Meetings and significant decisions.
8. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
9. Testing and/or inspections performed.
10. Signature of Contractor's authorized representative.

3.05 COORDINATION DRAWINGS

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

B. Review drawings prior to submission to Architect.

3.06 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.

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 - 016000 - 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. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. Highlight items for which a timely response has not been received to date.
   5. 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. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. 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.

3.07 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 - 013216 - 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.

3.08 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. "Reviewed", or language with same legal meaning.
      b. "Furnish as Corrected", or language with same legal meaning.
         1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
   2. Not Authorizing fabrication, delivery, and installation:
      a. "Revise and Resubmit".
         1) Resubmit revised item, with review notations acknowledged and incorporated.
         2) Non-responsive resubmittals may be rejected.
      b. "Rejected".
         1) Submit item complying with requirements of Contract Documents.
      c. "Submit Specific Item"
         1) Submit specific Item for review priior to 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

This page intentionally left blank

SECTION 013216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

1.03 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

1.04 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule.

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

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

D. Submit updated schedule with each Application for Payment.

E. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

F. Submit under transmittal letter form specified in Section 013000 - Administrative Requirements.

1.05 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.06 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Include and highlight the proposed project phases. include the prroposed starting date for each phase.

C. Diagram Sheet Size: Maximum 22 x 17 inches (560 x 432 mm).

D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules for each stage of Work identified in Section 011000 - Summary.

E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

F. Indicate delivery dates for owner-furnished products.

G. Coordinate content with schedule of values specified in Section 012000 - Price and Payment Procedures.

H. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 3 EXECUTION

1.01 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.

1.02 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

This page intentionally left blank

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

B. Security requirements.

C. Waste removal facilities and services.

D. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 015213 - Field Offices and Sheds.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.04 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.

1.05 INTERIOR ENCLOSURES

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

B. Construction: Framing and gypsum board sheet materials with closed joints and sealed edges at intersections with existing surfaces:
   1. STC rating of 35 in accordance with ASTM E90.

1.06 SECURITY - SEE SECTION 013553

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.

1.07 WASTE REMOVAL

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
   1. Coordinate the location of any dumpsters with the Owner.

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

D. 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.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
   1. Coordinate the location of proposed chutes with the Owner.

1.08 FIELD OFFICES - SEE SECTION 015213

A. Coorinate with the Owner to provide a space in the building for a field off

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015100
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.03 TEMPORARY ELECTRICITY

A. Cost: By Owner.

B. Connect to Owner's existing power service.
   1. Do not disrupt Owner's need for continuous service.
   2. Exercise measures to conserve energy.

C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.

D. Provide main service disconnect and over-current protection at convenient location and meter.

E. Permanent convenience receptacles may be utilized during construction.

F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

1.05 TEMPORARY HEATING

A. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.

B. Owner's existing heat plant may be used.
   1. Exercise measures to conserve energy.

C. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.06 TEMPORARY COOLING

A. Cost of Energy: By Owner.

B. Maintain maximum ambient temperature of 80 degrees F (26 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.

C. Owner's existing cooling plant may be used.
   1. Exercise measures to conserve energy.

D. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
   1. Provide temporary HEPA filters for all ductwork in construction areas to prent dust from entering the existing mechanical system.

1.07 TEMPORARY VENTILATION

A. Existing ventilation equipment may not be used.

1.08 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Contractor.

B. Connect to existing water source.
   1. Exercise measures to conserve water.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 016000
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. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Lists of products to be removed from existing building.

B. Section 011000 - Summary: Identification of Owner-supplied products.

C. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

D. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

E. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

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

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

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

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

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

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
   1. See Section 011000 for list of items required to be salvaged for reuse and relocation.
   2. Exception: Alterante No. 1

2.02 NEW PRODUCTS

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

B. Use of products having any of the following characteristics is not permitted:
   1. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 016116.
   2. If wet-applied, have lower VOC content, as defined in Section 016116.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. 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. See Section 012500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

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

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

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

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

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

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

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

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

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.

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

C. Store with seals and labels intact and legible.

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

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

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

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

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

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

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

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

END OF SECTION

This page intentionally left blank

SECTION 017000
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. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

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

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 014000 - Quality Requirements: Testing and inspection procedures.

C. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 017419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

E. Section 024100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

F. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

A. See Section 013000 - 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 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. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. 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.

C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.

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 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

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

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

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

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

3.02 PREPARATION

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

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

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

3.03 LAYING OUT THE WORK

A. Promptly notify Architect of any discrepancies discovered.

3.04 GENERAL INSTALLATION REQUIREMENTS

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

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

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

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

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

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

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and _____): 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.

D. 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.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
2. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

F. 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.

G. 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.

H. Clean existing systems and equipment.

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

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

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

3.06 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 078400, 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.

3.07 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.

3.08 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.

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

3.10 DEMONSTRATION AND INSTRUCTION

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

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

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

3.11 ADJUSTING

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

3.12 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

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

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

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

E. Clean filters of operating equipment.

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

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

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. Owner will occupy portions of the building as specified in Section 011000.

F. 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.

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

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

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

3.14 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

This page intentionally left blank

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

E. 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.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 017800
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 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

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

D. 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. Materials Transparency Manual:
   1. Compile and submit a digital and a printed version of information disclosing materials content for interior finishes, furnishings (including workstations), built-in furniture. Meet IWBI (BS) requirements for format and content.

D. 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.

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. Changes made by Addenda and modifications.

F. Record Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

B. 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.

C. 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. 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 durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) 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. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

I. 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.

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.

END OF SECTION

This page intentionally left blank

SECTION 020342
REMOVAL AND SALVAGE OF PERIOD CONSTRUCTION MATERIALS

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

2.01 PERIOD TREATMENT, GENERAL

A. See Section 013591 for special procedure requirements related to elements and features of historical significance and value.

2.02 GENERAL PROCEDURES

A. Drawings indicating existing construction, building services, and site utilities are based on casual field observation and existing record documents only.
   1. Report discrepancies to Architect before disturbing existing historic elements.
   2. Beginning of work constitutes acceptance of existing conditions that are apparent upon examination at that time.

B. Separate spaces in which removals and salvage operations are conducted from occupied spaces.
   1. Provide, erect, and maintain temporary dustproof partitions; see Section 015000.

2.03 ENVIRONMENTAL CONTROLS

A. Comply with federal, state, and local regulations pertaining to water, air, solid waste, recycling, chemical waste, sanitary waste, sediment, and noise pollution.

2.04 ITEMS TO BE SALVAGED

A. General: Salvage elements and components to the maximum extent possible. Maintain a chain of custody of salvaged materials, including the condition of such materials before and after salvage operations.

2.05 MATERIALS TO BE REMOVED

A. Remove existing nonhistoric elements as indicated and as required to allow direct access to period construction elements indicated to be restored or salvaged for reuse.

B. Protect existing historic elements.
   1. Prevent movement of structure; provide temporary, removable shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly, minimizing overcutting.

2.06 MATERIALS TO BE RECYCLED

A. Recycle removed nonhistoric materials to the maximum extent possible. Remove recyclable materials by hand wherever possible.

B. Recycle items indicated on drawings.

This page intentionally left blank

SECTION 024100
DEMOLITION

PART 3 EXECUTION

1.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

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

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

C. 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.

1.02 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.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.

C. Remove existing work as indicated and required to accomplish new work.
   1. 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.

1.03 DEBRIS AND WASTE REMOVAL

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

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

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

END OF SECTION

SECTION 061053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

A. PS 20 - American Softwood Lumber Standard; 2021.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

END OF SECTION

This page intentionally left blank

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 123600 - Countertops.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.

C. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   5. Replace, repair, or rework all work for which certification is refused.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Single Source Responsibility: Provide and install this work from single fabricator.

2.02 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Cabinet Design Series: As indicated on drawings.

C. Cabinet Style: Flush overlay.
   1. Cabinet Doors and Drawer Fronts: Flush style.
   2. Drawer Side Construction: Multiple-dovetailed.
   3. Drawer Construction Technique: Dovetail joints.

2.03 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.04 PANEL CORE MATERIALS

A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.

2.05 THERMALLY FUSED LAMINATE PANELS

A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
   1. Test in accordance with NEMA LD 3 Section 3.
   2. Panel Core Substrate: Particleboard.

2.06 LAMINATE MATERIALS

A. Manufacturers:
   1. Arborite; ColorEdge: www.arborite.com/#sle.
   2. Wilsonart LLC: www.wilsonart.com/#sle.

B. Provide specific types as indicated.
   1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, finish as indicated.
   2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, finish as indicated.
   3. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, finish as indicated.
   4. Laminate Backer: BKL, 0.020 inch (0.51 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.07 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's standard range.

C. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.08 HARDWARE

A. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

B. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.

C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers ("U" shaped wire pull, steel with chrome finish, 100 mm centers).

D. Keyed Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

E. Drawer Slides:
   1. Type: Extension types as indicated.

2. Static Load Capacity: Commercial grade.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self closing/stay closed type.
6. Manufacturers:
   a. Accuride International, Inc; Heavy-Duty Drawer Slides: www.accuride.com/#sle.
   b. Knape & Vogt Manufacturing Company; Heavy-Duty Drawer Slides: www.knapeandvogt.com/#sle.

F. Hinges: European style concealed self-closing type, steel with nickel-plated finish.

2.09 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)
   1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
   2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
   1. Provide center matched panels at each elevation.

F. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches (400 mm) on center.

G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

3.03 ADJUSTING

A. Adjust installed work.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.05 SCHEDULE OF LAMINATES

A. PL-1:
   1. Manufacturer: Wilsonart
   2. Color: Phantom Ecru
   3. Finish: Matt

B. PL-2
   1. Manufacturer: Arborite
   2. Color: P-297 CA "Tatami Wasabi"
   3. Finish: Matt

C. PL-3: Not Used

D. PL-4
   1. Manufacturer: Formica
   2. Color: 8842 "Weathered Ash"
   3. Finish: Woodbrush (WR)

E. PL-5:
   1. Manufacturer: Wilsonart
   2. Color: D96-60 "Shadow"
   3. Finish: Matt

END OF SECTION

SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Cutting and patching.

B. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

C. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.

D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.

E. ITS (DIR) - Directory of Listed Products; Current Edition.

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

G. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

H. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

I. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from authority having jurisdiction indicating approval of materials used.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days

after installation of materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.03 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

B. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches (100 mm) or less: Caulk or putty.

C. Firestopping at Combustible Pipe and Conduit Penetrations, of diameter 6 inches (___ mm) or less: Manufactured device.
   1. Floors: UL Design No. F-A-2217 or equal, F Rating 2 hour.
   2. Stairway Walls: UL Design No. W-J-2039 or equal, F Rating 2 hour.
   3. Other Interior Partitions: UL Design No. W-L-2119 or equal, F Rating 1 hour.

D. Firestopping at Cable Tray Penetrations: Any material meeting requirements.

E. Firestopping at Cable Penetrations, not in Conduit or Cable Tray: Caulk or putty.

F. Firestopping at Control Joints (without Penetrations): Any material meeting requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

This page intentionally left blank

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

C. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

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 C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

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 E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

K. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

L. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - 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. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. 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. Installation Plan: Submit at least four weeks prior to start of installation.

F. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

G. 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.

H. Installation Log: Submit filled-out log for each length or instance of sealant installed.

I. Executed warranty.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Installation Plan: Include schedule of sealed joints, including the following:
   1. Installation Log Form: Include the following data fields, with known information filled out.
      a. Date of installation.
      b. Name of installer.
      c. Actual joint width; provide space to indicate maximum and minimum width.
      d. Actual joint depth to face of backing material at centerline of joint.
      e. Air temperature.

C. 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.

D. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
   6. 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.

E. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches (457 mm) 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 (25.4 mm) 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.

1.06 WARRANTY

A. See Section 017800 - 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 MANUFACTURERS

A. Nonsag Sealants:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Dow: www.dow.com/#sle.
   3. Pecora Corporation: www.pecora.com/#sle.
   4. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.02 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.

2.03 NONSAG JOINT SEALANTS

A. 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. Application: Toilet room celings to tile walls, toilet room plumbing fixtures to tile walls and floor.
   2. Color: White.
   3. Products:
      a. Dow; DOWSIL 786 Silicone Sealant: www.dow.com/#sle.
      b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
      c. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

B. 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. Application: Interior joints not located in wet areas, toilet rooms, kitchens, or laboratories.
   4. Products:
      a. Franklin International, Inc; Titebond Painter's Plus Caulk: www.titebond.com/#sle.
      b. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
      c. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

C. Siliconized Acrylic Latex Sealant: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging, not intended for exterior use.
   1. Application: Gypsum Board to Aluminum Windows, Kitchen countertops, Laboratory countertops.
   2. Color: To be selected by Architect from manufacturer's standard range.
   3. Grade: ASTM C834 Grade 0 Degrees F (Minus 18 Degrees C)
   4. Products:
      a. DAP Global; ALEX PLUS: www.dap.com
      b. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements

2.04 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
   3. Record each test on Preinstallation Adhesion Test Log as indicated.
   4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION

This page intentionally left blank

SECTION 080671
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Requirements to comply with in coordination with this section.

1.03 REFERENCE STANDARDS

A. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

B. BHMA A156.18 - Materials and Finishes; 2020.

C. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Only manufacturers listed in Door Hardware Schedule or Section 087100 are considered acceptable, unless noted otherwise.

B. Obtain each type of door hardware as indicated from a single manufacturer and single supplier.

C. Manufacturer's Abbreviations: Coordinate with manufacturers listed in Section 087100.
   1. BAS - Best Access Systems.
   2. GJ - Glynn Johnson.
   3. IVE - Ives.
   4. LCN - LCN.
   5. PEM - Pemko.
   6. ROC - Rockwood.
   7. SCH - Schlage.
   8. VD - Von Duprin.

2.02 DESCRIPTION

A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.
   1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.
   2. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.
   3. Quantities listed are for each Pair (PR) of doors, or for each Single (SGL) door, as indicated in hardware sets.

2.03 FINISHES

A. Finishes: Complying with BHMA A156.18.
   1. Code 626: Satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D).
   2. Code 630: Satin stainless steel, with stainless steel 300 series base material (former US equivalent US32D).
   3. Code 652: Satin chromium plated over nickel, with steel base material (former US equivalent US26D).
   4. Code 689: Aluminum painted, with any base material (former US equivalent US28).

PART 3 EXECUTION

3.01 DOOR HARDWARE SCHEDULE

A. Organize listing of door hardware components within each hardware set in compliance with 10-Part scheduling sequence indicated in DHI (H&S), unless otherwise indicated.

3.02 HARDWARE SET # 01: "UNISEX RESTROOM"

A. For use on Door Number(s): 224.1, 225.1 and 226.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
4 Each		HINGE	5BB1 4.5 X 4.5	652	IVE
1 Each	F76	PRIVACY LOCK	ND40-RHO-OS-OCC	626	SCH
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		WALL STOP	WS407CVX	630	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.03 HARDWARE SET # 02: "CORIDOR DOORS"

A. For use on Door Number(s): 313.1, 352.1, and 354.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
4 Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 Each	F82	ENTRANCE LOCK	ND91-RHO	626	SCH
1 Each		PERMANENT CORE	OWNER SUPPLIED	626	BAS
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		KICK PLATE	8400 10 Inch X 2 Inch LDW	630	IVE
1 Each		WALL STOP	WS407CVX	630	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.04 HARDWARE SET # 03: "PASSAGE"

A. For use on Door Number(s): 233.1, 234.1, 235.1, 236.1, 239.1, 249.1, 254.1, 263.1, 266.2, 267.1, and 306.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
2 Each	F75	PASSAGE SET	ND10S-RHO	626	SCH
2 Each		SURFACE CLOSER	4011	689	LCN
2 Each		WALL STOP	WS407CVX	626	IVE
2 Each		SILENCER	SR64	GRY	IVE

3.05 HARDWARE SET # 04: "CLOSET"

A. For use on Door Number(s): 359.2.

B. Provide for each Pair (PR) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
6 Each		HINGE	5BB1 4.5 X 4.5	652	IVE
2 Each		ROLLER LATCH	RL32	626	IVE
2 Each		DUMMY HANDLE	ND170-RHO	626	SCH
1 Each		OH STOP	450S	630	GJ
1 Each		WALL STOP	WS407CVX	630	IVE

3.06 HARDWARE SET # 05: "OFFICE"

A. For use on Door Number(s): 105.1, 106.1, 205.1, 212.1, 232.1, 242.1, 243.1, 245.1, 246.1, 257.1, 258.1, 259.1, 261.1, 262.1, 269.1, 303.1, 304.1, 305.1, 307.1, 315.1, 324.1, 326.1, 327.1, 328.1, 331.1, 332.1, 335.1, 336.1, 337.1, 349.1, 351.1, 353.1, 355.1., 361.1, 372.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	5BB1 4.5 X 4.5	652	IVE
1 Each	F17	LOCKSET	ND53JD-RHO	626	SCH
1 Each		PERMANENT CORE	OWNER SUPPLIED	626	BAS
1 Each		WALL STOP	WS407CVX	630	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.07 HARDWARE SET # 06: "STAIRWAY"

A. For use on Door Number(s): 201.1 and 301.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
4 Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 Set		PASSAGE SET	ND10S-RHO	629	ROC
1 Each		SURFACE CLOSER	4040XP	689	LCN
1 Each		WALL STOP	WS407CVX	630	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.08 HARDWARE SET # 07: "STORE ROOM"

A. For use on Door Number(s): 146.1, 238.1, 247.1, 251.1, 256.1, 268.1, 271.1, 339.1, 339.2.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	5BB1 4.5 X 4.5	652	IVE
1 Each	F84	STOREROOM LOCK	ND80-RHO	626	SCH
1 Each		PERMANENT CORE	OWNER SUPPLIED	626	BAS
1 Each		WALL STOP	410S	630	IVE
1 Each		KICK PLATE	8400 10' X 2' LDW	630	IVE
1 Each		SILENCER	SR64	GRY	IVE

3.09 HARDWARE SET # 08: "RESTROOMS"

A. For use on Door Number(s): 322.1, 323.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
4 Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 Each		PASSAGE SET	ND10S-RHO	630	IVE
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		KICK PLATE	8400 10' X 2' LDW	630	IVE
1 Each		WALL STOP	WS33	626	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.10 HARDWARE SET #O9: "UNISEX RESTROOM"

A. For use on Door Number(s): 253.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	5BB1 4.5 X 4.5	652	IVE
1 Each	F76	PRIVACY LOCK	ND40-RHO-OS-OCC	626	SCH
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		WALL STOP	WS407CVX	630	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.11 HARDWARE SET #10: "UNISEX RESTROOM"

A. For use on Door Number(s): 252.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	5BB1 4.5 X 4.5	652	IVE
1 Each	F76	PRIVACY LOCK	ND40-RHO-OS-OCC	626	SCH
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		OH STOP	410S	630	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.12 HARDWARE SET #11: "CORRIDOR TO CONFERENCE ROOM"

A. For use on Door Number(s): 213.1, 227.1, 228.1, 231.1, 265.1, 367.1, 369.1 and 371.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
4 Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 Each	F82	ENTRANCE LOCK	ND91-RHO	626	SCH
1 Each		PERMANENT CORE	OWNER SUPPLIED	626	BAS
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		KICK PLATE	8400 10 Inch X 2 Inch LDW	630	IVE
1 Each		OH STOP	410S	630	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.13 HARDWARE SET #12: "ELECTRICAL ROOM"

A. For use on Door Number(s): 217.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HINGE	5BB1 4.5 X 4.5	652	IVE
1 Each	F84	CLASSROOM LOCK	ND70-RHO	626	SCH
1 Each		PERMANENT CORE	OWNER SUPPLIED	626	BAS
1 Each		OH STOP	410S	630	IVE
1 Each		SURFACE CLOSER	4011	689	LCN
1 Each		MOUNTING PLATE	4010-18	689	LCN
1 Each		KICK PLATE	8400 10' X 2' LDW	630	IVE
1 Each		SILENCER	SR64	GRY	IVE

3.14 HARDWARE SET # 13: "AUDIOLOGY"

A. For use on Door Number(s): 255.1 and 255.2.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
2 Each	F75	PASSAGE SET	ND10S-RHO	626	SCH
2 Each		SURFACE CLOSER	4011	689	LCN
2 Each		WALL STOP	WS407CVX	626	IVE
1Each		PERIMETER GASKET	Q SERIES	BLACK	PEM
1 Each		AUTOMATIC DOOR BOTTOM	412_PKL	630	PEM

3.15 HARDWARE SET #14: "CARD READER"

A. For use on Door Number(s): 104.1, 128.1, 136.1, 148.2, 204.1, 208.1, 210.1, 216.1, 262.1, 309.1, 329.1, 338.1, 352.2, 358.1,and 359.1.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
4 Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 Each	F84	STOREROOM LOCK	ND80-RHO	630	SCH
1 Each		ELECTRIC STRIKE	6200 SERIES	630	VD
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		KICK PLATE	8400 10' X 2' LDW	630	IVE
1 Each		WALL STOP	WS33	626	IVE
3 Each		SILENCER	SR64	GRY	IVE
1 Each		CARD READER	BY OWNER		

C. Coordinate the wiring/controls with Owner's card reader or keypad.

3.16 HARDWARE SET #15: "ELECTRICAL ROOM"

A. For use on Door Number(s): 325.2.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
4 Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 Each	F86	STOREROOM LOCK	ND80-RHO	630	IVE
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		KICK PLATE	8400 10' X 2' LDW	630	IVE
1 Each		WALL STOP	WS33	626	IVE
3 Each		SILENCER	SR64	GRY	IVE

3.17 HARDWARE SET#16: "SERVICE ROOM"

A. For use on Door Number(s): 121.1, 123.1, 133.1, 265.1, 266.1, and 267.2.

B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
3 Each		HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 Each	F86	STOREROOM LOCK	ND80-RHO	630	IVE
1 Each		SURFACE CLOSER	4111 EDA	689	LCN
1 Each		KICK PLATE	8400 10' X 2' LDW	630	IVE
1 Each		WALL STOP	WS33	626	IVE
3 Each		SILENCER	SR64	GRY	IVE

END OF SECTION

This page intentionally left blank

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Sound-rated hollow metal doors and frames.

E. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing: Glass for doors and borrowed lites.

C. Section 099123 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NAAMM: National Association of Architectural Metal Manufacturers.

D. NFPA: National Fire Protection Association.

E. SCIF: Sensitive Compartmented Information Facility.

F. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2019.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.

E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

G. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. 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; 2021a.

J. 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.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

M. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Attenuation Between Rooms in Buildings; 2023.

N. ASTM E413 - Classification for Rating Sound Insulation; 2022.

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

P. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

Q. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

R. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

S. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

T. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

U. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

V. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

W. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

X. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

Y. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Z. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 013000 - 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. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

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

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 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/#sle.

2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Krieger Specialty Products: www.kriegerproducts.com/#sle.
4. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
5. Steelcraft, an Allegion brand: www.allegion.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Sound-Rated Hollow Metal Doors and Frames:
1. AMBICO Limited: www.ambico.com/#sle.
2. Krieger Specialty Products: www.kriegerproducts.com/#sle.

C. Sensitive Compartmented Information Facility (SCIF) Integrated Doors, Frames, and Hardware Assemblies:

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. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
4. 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.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
2. Frame Finish: Factory primed and field finished.

C. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.

D. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

E. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

F. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

2.04 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.05 ACCESSORIES

A. Glazing: As specified in Section 088000, factory installed.

B. Glazing Gaskets: Set galss in neoprene or silicone gaskets to provide sound isolation. gasket profile to be selected for specirfic glass and frame conditions proposed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

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 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. Install door hardware as specified in Section 087100.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 081213
HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal frames for non-hollow metal doors.

B. Fire-rated hollow metal frames for non-hollow metal doors.

C. Interior glazed borrowed lite frames.

1.02 RELATED REQUIREMENTS

A. Section 081416 - Flush Wood Doors: Non-hollow metal door for hollow metal frames.

B. Section 087100 - Door Hardware: Hardware, silencers, and weatherstripping.

C. Section 088000 - Glazing: Glazed borrowed lites.

D. Section 099123 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2019.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

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; 2020.

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; 2021a.

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

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

K. ITS (DIR) - Directory of Listed Products; Current Edition.

L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

N. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

O. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

S. UL (DIR) - Online Certifications Directory; Current Edition.

T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - 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 grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Samples: Submit one sample of frame metal, 2 by 2 inches (50 by 50 mm), showing factory finishes, colors, and surface textures.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

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

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Frames with Integral Casings:
   1. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   2. Republic Doors, an Allegion brand; ____: www.republicdoor.com/#sle.
   3. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.

B. Hollow Metal Frames with Applied Casings, Prefinished:
   1. IDP - International Door Products Corp; F Series Standard Steel Door Frame: www.idpframes.com/#sle.
   2. Timely Industries, Inc; _____: www.timelyframes.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Door Frame Type: Provide hollow metal door frames with both integral casings and applied casings, in separate locations as indicated.
   1. Interior 7'-10" Doors: Use frames with integral casings.
   2. Interior Doors: Use frames with applied casings.

B. 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.

C. Accessibility: Comply with ICC A117.1 and ADA Standards.

D. 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 frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.

E. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

2.03 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

A. Frame Finish: Factory primed and field finished.

B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

C. Fire-Rated Door Frames: Full profile/continuously welded type.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
   3. Provide units listed and labeled by ITS (DIR) or UL (DIR).
      a. Attach fire rating label to each fire rated unit.

2.04 HOLLOW METAL DOOR FRAMES WITH APPLIED CASINGS

A. Frame Type: Knockdown, slip-on drywall frames; separate jambs and head with separate snap-on casings both sides; factory-applied finish on exposed surfaces.
   1. Frame Material: Cold-rolled steel complying with ASTM A1008/A1008M.
   2. Casing Material: Formed steel.
   3. Casing Profile: As indicated.
   4. Finish: Factory-applied baked enamel finish, or electrostatically applied water-based paint.
      a. Color: Match PT-5. .

B. Interior Door Frames, Non-Fire-Rated:
   1. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.

C. Interior Door Frames, Fire-Rated: Provide smoke gaskets.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by testing agency acceptable to authorities having jurisdiction, ITS (DIR), or UL (DIR).
      b. Attach fire rating label to each fire rated unit.

D. Sound-Rated Door Frames: Provide sound gasketing at jambs and head and adjustable door bottom device.
   1. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
   2. Sound Rating: Tested with the door to achieve the rating specified for door opening.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.

C. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch (0.4 mm) dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
   1. Fire-Rated Frames: Comply with fire rating requirements indicated.

2.06 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

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 INSTALLATION

A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.

B. Install prefinished frames after painting and wall finishes are complete.

C. Install fire rated units in accordance with NFPA 80.

D. Coordinate frame anchor placement with wall construction.

E. Comply with glazing installation requirements of Section 088000.

F. Install door hardware as specified in Section 087100.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.5 mm) measured with straight edges, crossed corner to corner.

3.04 SCHEDULE

A. Refer to Door and Frame Schedule on drawings A9.1 and A9.2.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire-rated, non-rated, and acoustical.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

D. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Attenuation Between Rooms in Buildings; 2023.

E. ASTM E413 - Classification for Rating Sound Insulation; 2022.

F. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

G. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

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

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

J. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

K. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

L. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 8 by 10 inches (203 by 254 mm) in size illustrating wood grain, stain color, and sheen.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

G. Manufacturer's Installation Instructions: Indicate special installation instructions.

H. Installer's qualification statement.

I. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
   1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Algoma Hardwoods, I
   2. Eggers Industries
   3. Five Lakes Manufacturing, Inc.
   4. Marshfield Door Systems, Inc.
   5. Mohawk Flush Doors. Inc., a Masonite Company
   6. Oshkosh Architectural Door Company

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
   3. Sensitive Compartmented Information Facility (SCIF) Compliant Doors: Provide sound-rated door assembly in compliance with Technical Specifications for Construction and Management of SCIF or "Tech Specs" and other related documents; comply with ASTM E336 test methods for measurement of sound between rooms.
      a. Application: Doors 255.1 and 255.2.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Red oak, veneer grade in accordance with quality standard indicated, plain sliced to match existing, with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Any option allowed by quality standard for grade.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Sheen: Flat.

B. Factory finish doors in accordance with approved sample.
   1. Finish to match existing doors to remain.

C. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 081113.

B. Wood Louvers:
   1. Material and Finish: Oak species.
   2. Louver Blade: Flush louver.

C. Glazed Openings:

D. 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 (1.21 mm), galvanized steel.
   3. Metal Finish: Beige polyester powder coating.

E. Glazing: See Section 088000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 083313
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

B. Electric motor operation; wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Rough openings.

B. Section 092116 - Gypsum Board Assemblies: Rough openings.

C. Section 099123 - Interior Painting: Field paint finish.

D. Section 260533.13 - Conduit for Electrical Systems: Conduit from electric circuit to operator and from operator to control station.

E. Section 260583 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. NEMA MG 1 - Motors and Generators; 2021.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

E. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Samples: Two slats, 4 inches long (102 mm long), illustrating shape, color, and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

F. Installer's qualification statement.

G. Specimen warranty.

H. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

I. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

1.05 QUALITY ASSURANCE

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

B. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for counterbalance shaft assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. Alpine Overhead Doors, Inc: www.alpinedoors.com/#sle.
   2. Clopay Corporation: www.clopaydoor.com
   3. Raynor Garage Doors: www.raynor.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Metal Doors, Non-Fire-Rated: Stainless steel slat curtain.
   1. Mounting: Between jambs, within prepared opening.
   2. Nominal Slat Size: 1-1/4 inches (32 mm) wide.
   3. Slat Profile: Flat.
   4. Finish, Stainless Steel: No. 4 - Brushed.
   5. Guides: Formed track; same material and finish unless otherwise indicated.
   6. Hood Enclosure: Manufacturer's standard; primed steel.
   7. Electric operation.
   8. Locking Devices: Slide bolt on inside.

2.03 COMPONENTS

A. Metal Curtain Construction: Interlocking, single-thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Stainless Steel Slats: ASTM A666, Type 304; minimum thickness 22 gauge, 0.03 inch (0.8 mm).

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Stainless Steel Guides: ASTM A666, Type 304, rollable temper.

C. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.
   2. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.

D. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction (AHJ) as suitable for purpose specified and indicated.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure: NEMA MG 1.
   3. Motor Rating: As recommended by manufacturer; continuous duty.
   4. Motor Voltage: 110-120 VAC, single phase, 60 Hz.
   5. Opening Speed: 6 inches per second (150 mm/sec).

6. Manual override in case of power failure.

C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each electrical operator.
   1. Controls: 24 VAC circuit.
   2. Surface mounted.

D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

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

B. Install fire-rated doors in accordance with NFPA 80.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Coordinate installation of electrical service with Section 260583.

G. Complete wiring from disconnect to unit components.

H. Complete wiring from fire alarm system .

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).

C. Maximum Variation From Level: 1/16 inch (1.5 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

This page intentionally left blank

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 080671 - Door Hardware Schedule: Schedule of door hardware sets.

B. Section 081113 - Hollow Metal Doors and Frames.

C. Section 081416 - Flush Wood Doors.

D. Section 281000 - Access Control: Electronic access control devices.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. BHMA (CPD) - Certified Products Directory; Current Edition.

C. BHMA A156.1 - Standard for Butts and Hinges; 2021.

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

E. BHMA A156.4 - Door Controls - Closers; 2019.

F. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

G. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

H. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.

I. BHMA A156.16 - Auxiliary Hardware; 2018.

J. BHMA A156.18 - Materials and Finishes; 2020.

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

L. BHMA A156.25 - Electrified Locking Devices; 2023.

M. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2019.

N. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

O. DHI (KSN) - Keying Systems and Nomenclature; 2019.

P. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.

Q. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

R. ITS (DIR) - Directory of Listed Products; Current Edition.

S. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

T. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

U. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

V. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

W. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

X. UL (DIR) - Online Certifications Directory; Current Edition.

Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Z. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

D. Keying Requirements Meeting:
   1. Schedule meeting at project site prior to Contractor occupancy.
   2. Attendance Required:
      a. Contractor.
      b. Owner.
      c. Architect.
      d. Installer's Architectural Hardware Consultant (AHC).
      e. Hardware Installer.
      f. Owner's Security Consultant.
   3. Agenda:
      a. Establish keying requirements.
   4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   5. 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.
   6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

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

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Provide complete description for each door listed.
   3. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.

D. Samples for Verification:
   1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
   2. Submit one (1) sample of hinge, latchset, lockset, closer, and _____ illustrating style, color, and finish.
   3. Return full-size samples to Contractor.
   4. Submit product description with samples.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.

G. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

H. Installer's qualification statement.

I. Supplier's qualification statement.

J. Specimen warranty.

K. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

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

C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Locksets and Cylinders: Three years, minimum.
   3. 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. Accessibility: ADA Standards and ICC A117.1.
   3. Applicable provisions of NFPA 101.
   4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or _____ as suitable for application indicated.
   6. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in

accordance with UL 1784.

7. Listed and certified compliant with specified standards by BHMA (CPD).
8. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
9. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
   1. See Section 281000 for additional access control system requirements.

E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule.

F. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   2. Fire-Rated Applications: Comply with NFPA 80.
      a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
      b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 HINGES

A. Manufacturers:
   1. Basis of Design: Ives, an Allegion brand: www.allegion.com/us.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Provide hinges on every swinging door.
   2. Provide following quantity of butt hinges for each door:
      a. Doors up to 60 inches (1.5 m) High: Two hinges.
      b. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.
      c. Doors 90 inches (2.3 m) High up to 120 inches (3 m) High: Four hinges.

2.03 ELECTRIC STRIKES

A. Manufacturers:
   1. Basis of Design: Von Duprin, an Allegion brand: www.allegion.com/us.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Electric Strikes: Comply with BHMA A156.31, Grade 1.
   1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
   2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.

2.04 CYLINDRICAL LOCKS

A. Manufacturers:
   1. Basis of Design: Schlage, an Allegion Brand: www.allegion.com/us.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
   1. Bored Hole: 2-1/8 inch (54 mm) diameter.
   2. Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
   3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.

4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
    a. Finish: To match lock or latch.

2.05 CLOSERS

A. Manufacturers; Surface Mounted:
    1. Basis of Design: LCN, an Allegion brand: www.allegion.com/us.

B. Closers: Comply with BHMA A156.4, Grade 1.
    1. Type: Surface mounted to door.
    2. Provide door closer on each fire-rated and smoke-rated door.
        a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
    3. At corridor entry doors, mount closer on room side of door.

2.06 OVERHEAD STOPS AND HOLDERS

A. Manufacturers:
    1. Basis of Design: Ives, an Allegion brand: www.allegion.com/us.
    2. Substitutions: See Section 016000 - Product Requirements.

B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.

2.07 PROTECTION PLATES

A. Manufacturers:
    1. Basis of Design: Ives, an Allegion brand: www.allegion.com/us.

B. Protection Plates: Comply with BHMA A156.6.

C. Metal Properties: Stainless steel material.
    1. Metal, Heavy Duty: Thickness 0.062 inch (1.57 mm), minimum.

D. Edges: Beveled, on four sides unless otherwise indicated.

E. Fasteners: Countersunk screw fasteners.

2.08 KICK PLATES

A. Manufacturers:
    1. Basis of Design: Ives, an Allegion brand: www.allegion.com/us.

B. Kick Plates: Provide along bottom edge of push side of doors as scheduled.
    1. Size: 12 inch (305 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.09 WALL STOPS

A. Manufacturers:
    1. Basis of Design: Ives, an Allegion brand: www. allegion.com/us.
    2. Substitutions: See Section 016000 - Product Requirements.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
    1. Type: Bumper, concave, wall stop.
    2. Material: Bronze housing with rubber insert.

2.10 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
    1. Basis of Design: Pemko, an Assa Abloy Group company: www.assaabloydss.com.
    2. Substitutions: See Section 016000 - Product Requirements.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
    1. Head and Jamb Type: Adjustable.
    2. Door Sweep Type: Encased in retainer.
    3. Material: Aluminum, with brush weatherstripping.

2.11 ROLLER LATCH

A. Manufacturers:
   1. Basis of Design: Ives, an Allegion brand: www.allegion.com/us.

B. Roller Latch: Provide on doors that are not frequently used and need to latch, and on doors that must stay in closed position within the frame.
   1. Location: Mount roller latch at top of door with strike plate fastened to head of door frame.

2.12 SILENCERS

A. Manufacturers:
   1. Basis of Design: Ives, an Allegion brand: www.allegion.com/us.

B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   1. Single Door: Provide three on strike jamb of frame.
   2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   3. Material: Rubber, gray color.

2.13 FINISHES

A. Finishes: Identified in Section 08 0671 - Door Hardware Schedule.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

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

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Install hardware for smoke and draft control doors in accordance with NFPA 105.

D. Use templates provided by hardware item manufacturer.

E. 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 Door Frames: See Section 081213.
   2. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017000 - 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 017000 - Execution and Closeout Requirements.

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

END OF SECTION

This page intentionally left blank

SECTION 088000
GLAZING

PART 1 GENERAL

4.01 SECTION INCLUDES

A. Glazing units.

B. Plastic films.

C. Laminated glass interlayers.

D. Glazing compounds.

4.02 RELATED REQUIREMENTS

A. Section 081213 - Hollow Metal Frames: Glazed borrowed lites.

B. Section 081416 - Flush Wood Doors: Glazed lites in doors.

C. Section 088813 - Fire-Rated Glazing.

4.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

H. ASTM F1642/F1642M - Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings; 2017.

I. GANA (SM) - GANA Sealant Manual; 2008.

J. GANA (LGRM) - Laminated Glazing Reference Manual; 2019.

4.04 ADMINISTRATIVE REQUIREMENTS

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

4.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch (305 by 305 mm) in size of glass units.

E. Installer's qualification statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

4.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
    a. Safety Glazing Certification Council (SGCC).

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

4.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

4.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

C. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

5.01 MANUFACTURERS

A. Float Glass Manufacturers:
1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
2. Guardian Glass, LLC: www.guardianglass.com/#sle.
3. Pilkington North America Inc: www.pilkington.com/na/#sle.
4. Saint Gobain North America: www.saint-gobain.com/#sle.
5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.

B. Laminated Glass Manufacturers:
1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
2. Tecnoglass; Laminated Glass: www.tecnoglass.com/#sle.
3. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com/#sle.

5.02 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
4. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on canopy, point-supported, spider wall, high-risk, sloping overhead, horizontal overhead, free-standing glass protective barrier, or other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with industry established testing requirements.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch (0.762 mm) thick, minimum.

5.03 GLAZING UNITS

A. Type G-1 - Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
    a. Glazed lites in doors, except fire doors.
    b. Glazed sidelights to doors, except in fire-rated walls and partitions.

c. Glazed view windows and panels in partitions, except in fire-rated walls and partitions.
d. Other locations required by applicable federal, state, and local codes and regulations.
e. Other locations indicated on drawings.

2. Glass Type: Fully tempered safety glass as specified.
3. Tint: Clear.
4. Thickness: 1/4 inch (6.4 mm), nominal.

B. Type G-2 - Security Glazing: Laminated glass, 3-Ply.
1. Applications: Service windows.
2. Tint: Clear.
3. Thickness: 1/2 inch (12.7 mm).
4. Outer Lite: Annealed glass.
5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
6. Middle Lite: Annealed glass.
7. Interlayer, Inboard Side : Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
8. Inside Lite: Annealed glass.

5.04 PLASTIC FILMS

A. Type F-1 - Decorative Plastic Film: Polyvinyl butyral (PVB) type.
1. Application: Locations as indicated on drawings.
2. Series Type: custom pattern.
a. Pattern shall be designed to transition horizontally from fully translucent to mostly transparent across six (6) 4'-10" wide by 7'-4" high glass panels. This pattern is to be installed in four (4) different atrium glazing walls.
b. Pattern is to be devleoped in collaboration between the architect, owner, and the film manufacturer/installer.
3. Color: as selected from manufacturers full range.
4. Width: 60 inch (1.5 m).
5. Manufacturers:
a. Avery Dennison; AX900 Super Cast Series Decorative Window Film - Etchmark: www.averydennison.com/#sle.
b. Llumar, an Eastman Chemical Company; Decorative Window Film, Llumar: www.llumar.com/#sle.
c. XPEL, Inc; DECORATIVE: www.xpel.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

5.05 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

6.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

6.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

6.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

6.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

6.05 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

6.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

6.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

This page intentionally left blank

SECTION 088813
FIRE-RATED GLASS – PILKINGTON PYROSTOP® BR

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fire-rated glazing materials installed as vision lights in fire-rated doors.
   2. Fire-rated glazing materials installed as [sidelites] [transoms] [borrowed lites] in fire-rated frames and [wall applications].

B. Related Sections include the following:
   1. Section 08 11 00 “Metal Doors and Frames” for vision panels in interior doors and interior vision panel (borrowed lites) frames.
   2. Section 08 14 16 “Flush Wood Doors” for vision panels in interior doors.
   3. [Section 09 21 00 “Gypsum Board Assemblies” for gypsum board and metal stud framed area separation partition walls.]

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E 119: Fire Tests of Building Construction and Materials.

B. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

C. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

D. Glass Association of North America (GANA):
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

E. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.

F. Underwriters Laboratories, Inc. (UL):
   1. UL 263: Fire tests of Building Construction and Materials
   2. UL 752: Ratings of Bullet Resistant Materials

G. Standard Council of Canada:
   1. CAN/ULC-S101 Standard Test of Fire Endurance Tests of Building Construction and Materials
   2. CAN/ULC-S104 Standard Method of Fire Tests of Door Assemblies
   3. CAN/ULC-S106 Standard Method of Fire Tests of Window and Glass Block Assemblies

H. .

1.03 PERFORMANCE REQUIREMENTS

A. Fire-rated, bullet-resistant-rated, clear and wireless glazing material for use in locations such as doors, sidelites, transoms, borrowed lites, and wall applications with fire rating requirements ranging from 45 minutes to 2 hours with required hose stream test; for use in interior and exterior applications.

B. Provides protection by reducing the radiant and conductive heat transfer

1.04 SUBMITTALS

A. Comply with requirements of Section 01 33 00.

B. Product data: Submit manufacturer’s technical data for each glazing material required, including installation and maintenance instructions.

C. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will

not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

D. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

E. Samples: Submit, for verification purposes, approx. 8-inch by 10-inch sample for each type of glass indicated.

1.05 QUALITY ASSURANCE

A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.

B. Fire Resistance Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire resistive assemblies.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials under provisions of Section 01 60 00.

B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.

C. Pilkington Pyrostop® BR must not be exposed outside the range -40 degrees F to 120 degrees F (-40 degree C to +50 degrees C) during storage and transportation.

D. Store off ground, under cover, protected from weather and construction activities.

E. Do not expose the non-PVB side of glass to UV light.

F. Store sheets of glass vertically. DO NOT lean.

1.07 WARRANTY

A. Provide manufacturer's limited warranty under provision of section 01 78 00.

PART 2 PRODUCTS

2.01 FIRE-RATED GLAZING MATERIALS

A. Manufacturer: Pilkington Pyrostop® BR as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065, voice (800.426.0279) fax (425.396.8300), e-mail sales@fireglass.com, website www.fireglass.com.

B. Composition: Composed of multiple sheets of "Optiwhite" high visible light transmission glass laminated with an intumescent interlayer. [Most configurations are available with a translucent interlayer for added obscurity and privacy.]

C. Properties:
   1. Fire Rating: 45 minutes
   2. Thickness: 3/4"
   3. Note: Care should be taken to not scratch products with surface-applied, anti-spalling film.

D. Permanently label each piece of Pilkington Pyrostop® BR with the appropriate marking.

E. Substitutions: No substitutions allowed.

2.02 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

A. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapor seal.

B. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as

applicable. Available Products:

1. Dow Corning 795 - Dow Corning Corp.
2. Silglaze-II 2800 - General Electric Co.
3. Spectrem 2 - Tremco Inc.

C. Setting Blocks: Hardwood or calcium silicate; glass width by 4 inches by 3/16 inch thick.

D. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.

E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.03 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Minimum required face or edge clearances.
3. Observable edge damage or face imperfections.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.02 INSTALLATION (GLAZING)

A. Comply with referenced GANA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

D. Place setting blocks located at quarter points of glass with edge block no more than 6-inches from corners.

E. Glaze vertically into labeled fire-rated metal frames or partition walls with the same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

F. Place glazing tape on free perimeter of glazing in same manner described above.

G. Do not remove protective edge tape.

H. Install removable stop and secure without displacement of tape.

I. Do not pressure glaze.

J. Glaze exterior openings with PVB layer toward the exterior of the building.

K. Knife trim protruding tape.

L. Apply cap bead of silicone sealant along void between the stop and the glazing, to uniform line, with bevel to form watershed away from glass. Tool or wipe sealant surface smooth.

M. Provide minimum 3/16 inch edge clearance.

N. Install in vision panels in fire-rated doors to requirements of NFPA 80.

O. Install so that appropriate UL and Pilkington Pyrostop® markings remain permanently visible.

3.03 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.

B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Acoustic insulation.

E. Cementitious backing board.

F. Gypsum wallboard.

G. Joint treatment and accessories.

H. Noise barriers in gypsum board assemblies.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 078400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

C. Section 079200 - 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. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

D. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

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 A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

H. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

I. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

J. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

K. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

L. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

M. 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.

N. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

O. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

P. ASTM C1288 - Standard Specification for Fiber-Cement Interior Substrate Sheets; 2017.

Q. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

R. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

S. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

T. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

U. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2019.

V. GA-600 - Fire Resistance and Sound Control Design Manual; 2021.

W. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

X. UL (FRD) - Fire Resistance Directory; Current Edition.

Y. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

Z. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

B. Sequencing: Install service utilities in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
   2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

D. Samples: Submit two samples of predecorated gypsum board, 12 by 12 inches (300 by 300 mm) in size, indicating finish color and texture.

E. Steel Framing Industry Association (SFIA) Certification:
   1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.

F. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

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

B. Documents at Project Site: Maintain at the project site a copy of manufacturer's instructions, erection drawings, and shop drawings.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

C. Store metal products to prevent corrosion.

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. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

B. Nonstructural Framing System Components: AISI S220; 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 (L/120 at 240 Pa).
   1. Studs: C-shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.
   4. Flexible Track: Flexible framing consisting of adjustable leg straps and pivoting, hinged track brackets designed to provide curved framing assemblies of varying radii.
      a. Dimensions: 3-5/8 inches (92 mm) deep by 1-3/16 inches (30.2 mm) high in lengths and configurations indicated.
   5. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
   6. Resilient Furring Channels: Single or double leg configuration; 1/2 inch (13 mm) channel depth.

C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent 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.
   3. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
      a. Products:
         1) ClarkDietrich; BlazeFrame RipTrak: www.clarkdietrich.com/#sle.
         2) FireTrak Corporation; Posi Klip: www.fire-trak.com/#sle.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   4. Gold Bond Building Products, LLC provided by National Gypsum Company; ____: www.goldbondbuilding.com/#sle.
   5. USG Corporation: www.usg.com/#sle.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
      b. Ceilings: 5/8 inch (16 mm).
   4. Paper-Faced Products:
      a. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.

b. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
c. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
d. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield C 5/8" Gypsum Board: www.goldbondbuilding.com/#sle.
e. USG Corporation; Sheetrock Brand Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.

5. Mold-Resistant, Paper-Faced Products:
   a. Application: Toilet room ceilings
   b. Products:
      1) American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
      2) CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
      3) Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
      4) Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.
      5) USG Corporation; Sheetrock Brand Mold Tough Firecode SCX Panels 5/8 in. (15.9 mm): www.usg.com/#sle.

C. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including toilet room walls.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with ASTM C1288.
   a. Thickness: 5/8 inch (16 mm).
   b. Products:
      1) FinPan, Inc.; ProTEC: www.finpan.com
      2) James Hardie Building Products, Inc: www.jameshardie.com/#sle.
      3) USG Corporation; Durock Brand Glass-Mat Tile Backerboard SGX 5/8 in. (15.9 mm): www.usg.com/#sle.
      4) Substitutions: See Section 016000 - Product Requirements.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness as required for STC.
1. Application: in all office, exam room, and conference room walls.

B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
2. Tape Thickness: 1/4 inch (6 mm).

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
   a. Products:
      1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
      2) ClarkDietrich; Strait-Flex OS-300: www.clarkdietrich.com/#sle.
      3) Trim-Tex, Inc: www.trim-tex.com/#sle.
      4) Substitutions: See Section 016000 - Product Requirements.
2. L-Trim with Tear-Away Strip: Sized to fit 1/2-inch (13 mm) thick gypsum wallboard.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
   2. Joint Compound: Setting type, field-mixed.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

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 C1007AISI S220 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach 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.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.

F. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

G. Blocking: Install wood blocking for support of:
   1. Wall-mounted cabinets.
   2. Toilet partitions.
   3. Toilet accessories.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

C. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

H. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Corner Beads: Install at external corners, using longest practical lengths.

B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use fiberglass joint tape, embed with drying type joint compound and finish with drying 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.
   2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

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 (0.8 mm).

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.08 CLEANING

A. Clean _____.

3.09 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Stone thresholds.

E. Ceramic accessories.

F. Ceramic trim.

G. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 092116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017 (Reaffirmed 2022).

C. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.

F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

G. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).

J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

L. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

M. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.

N. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).

O. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

P. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

Q. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

R. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.

S. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).

T. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2019.

U. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

V. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).

W. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.

E. Installer's Qualification Statement:
   1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 10 of each type.

1.06 QUALITY ASSURANCE

A. Maintain one copy of ANSI A108/A118/A136 and TCNA (HB) on site.

B. Installer Qualifications: Natural Stone Institute (NSI) Accredited Commercial B Contractor (light commercial): www.naturalstoneinstitute.org/#sle.

C. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.
   2. Installer Certification:
      a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: As scheduled .

B. Glazed Wall Tile, Type CT-1: ANSI A137.1 standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: 6 by 6 inch (152 by 152 mm), nominal.
   3. Edges: Cushioned.
   4. Surface Finish: High gloss.
   5. Manufacturer: Dal-Tile Corporation: www.daltile.com/#sle.
   6. Distributor: Dal-Tile, Megan Erickson, Phone: (734)740-3078, Email: megan.erickson@daltile.com
   7. Collection: Semi-Gloss
   8. Color(s): K175 "Biscuit".
   9. Pattern: Brick. See interior elevations.
   10. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.

C. Porcelain Tile, Type CT-2: ANSI A137.1 standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 12 by 24 inch (305 by 610 mm), nominal.
   3. Thickness: 3/8 inch (9.5 mm).
   4. Edges: Cushioned.
   5. Surface Finish: Non-slip.
   6. Color(s): To be selected by Architect from manufacturer's standard range.
   7. Manufacturer: Ceasar Ceramics USA: www.ceasarceramicsusa.com
   8. Distributor: Virginia Tile, Robin Chamberlain-Speer, Phone: (734)765-6875, Email: robin.speer@virginiatile.com
   9. Collection: "Inner"
   10. Color(s): "Shore".
   11. Pattern: Brick. See drawing A6.1.

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
      b. Floor to Wall Joints: 6x6 Cove base.
   2. Manufacturers: Same as for tile.

B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of floor tile.
      b. Transition between floor finishes of different heights.
   2. Manufacturers:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

C. Thresholds: 2 inches (51 mm) wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
   1. Thickness: 1/2 inch (12.7 mm).
   2. Material: Marble, honed finish.
   3. Applications:
      a. At doorways where tile terminates.

2.03 SETTING MATERIALS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.
   4. LATICRETE International, Inc: www.laticrete.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
   1. Applications: Use this type of bond coat where Large and Heavy Tile (LHT) mortar is indicated.

C. Water Based Adhesive: Multi-purpose type mastic.
   1. Applications: Wall tile.
   2. Products:
      a. LATICRETE International, Inc.; 253 Gold.
      b. Substitutions: See Section 016000 - Product Requirements.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: Toilet room walls and floors.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. ARDEX Engineered Cements; ARDEX WA: www.ardexamericas.com/#sle.
      b. Bostik Inc; "Neverseal": www.bostik-us.com/#sle.
      c. H.B. Fuller Construction Products, Inc; TEC AccuColor EFX Epoxy Special Effects Grout: www.tecspecialty.com/#sle.
      d. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.

2.05 MAINTENANCE MATERIALS

A. Grout Release: Temporary, water-soluble pre-grout coating.

2.06 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
   1. Crack Resistance: No failure at 1/8 inch (3.2 mm) gap, minimum.
   2. Fluid or Trowel Applied Type:
      a. Material: Synthetic rubber or Acrylic.

b. Thickness: 20 mils (0.5 mm), maximum.
c. Products:
1) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane: www.tecspecialty.com/#sle.
2) LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com/#sle.
3) Merkrete, by Parex USA, Inc; Merkrete Fracture Guard: www.merkrete.com/#sle.

B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch (11 mm) thick; 2 inch (51 mm) wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Install thresholds where indicated.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Use uncoupling membrane under all tile unless other underlayment is indicated.
   2. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCNA (HB) Method F115.

B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

D. 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; 2022.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until 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 013000 - 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 (150 by 150 mm) in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 6 inches (150 mm) 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 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), 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/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels, Type ACT-2: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Pattern: "D" - fissured.
   2. Size: 24 by 24 inches (610 by 610 mm).
   3. Thickness: 5/8 inch (16 mm).
   4. Panel Edge: Beveled tegular.
   5. Color: White.
   6. Suspension System: Exposed grid.
   7. Products:
      a. Armstrong World Industries, Inc; Cortega: www.armstrongceilings.com/#sle.

C. Acoustical Panels, Type ACT-1: Glass fiber with membrane-faced overlay, attached to suspended ceiling grid with baffle clips, with the following characteristics:
   1. Classification: ASTM E1264 Type XII.
      a. Pattern: "E" - lightly textured.
   2. Size: 24 by 24 inches (610 by 610 mm).
   3. Thickness: 1-1/2 inches (38 mm).
   4. Panel Edge: Square tegular.
   5. Color: White.
   6. Suspension System: 15/16" Exposed.
   7. Products:
      a. Armstrong World Industries, Inc; Optima: www.armstrongceilings.com/#sle.

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, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

B. Exposed Suspension System: Galvanized steel grid with steel cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch (24 mm) face width.
   3. Finish: Baked enamel.
   4. Color: White.
   5. Acceptable Manufacturers:
      a. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
      b. Certainteed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
      c. USG Corporation: www.usg.com/ceilings/#sle.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) 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. 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 (152 mm) 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. Make field cut edges of same profile as factory edges.
   2. Double cut and field paint exposed reveal edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Static control resilient sheet flooring.

B. Resilient tile flooring.

C. Static control resilient tile flooring.

D. Resilient base.

E. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers; 1998 (Reapproved 2023).

B. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018).

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

D. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

E. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

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

1.04 SUBMITTALS

A. See Section 013000 - 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. Shop Drawings: Indicate seaming plans and floor patterns.

D. Accessories Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Vinyl Tile Verification Samples: Submit two samples, 12 by 6 inch (___ by ___ mm) in size illustrating color and pattern for each vinyl tile product specified.

F. Rubber Base Verification Samples: Submit two samples, 2 by 4 inch (___ by ___ mm) in size illustrating colors and proifle for each rubber base product specified.

G. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

H. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

I. Installer's Qualification Statement.

J. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: _____ square feet (_____ square meters) of each type and color.
   3. Extra Wall Base: _____ linear feet (_____ linear meters) of each type and color.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

B. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. Do not double stack pallets.

1.07 FIELD CONDITIONS

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile - Type LVT-1: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
   1. Baisis of Design Product: "Natural Elements" as manufactured by Flexco Corporation.
      a. Line: Premimum Luxury Vinyl Plank
      b. Color: 662 "Barn Oak"
      c. Plank size: 48"x6"
   2. Other acceptable manufacturers with similar products:
      a. Karndean Designflooring; Karndean Art Select: www.karndean.com#sle.
      b. Mannington Commercial: www.manningtoncommercial.com#sle.
   3. Minimum Requirements: Comply with ASTM F1700, Class III.
   4. Mold and Microbial Resistance: Highly resistant when tested in accordance with ASTM D6329.
   5. Wear Layer Thickness: 0.020 inch (0.50 mm).
   6. Total Thickness: 0.20 inch (5 mm).
   7. Tile Edge: Interlocking shape.
   8. Pattern: staggard joints with minimum 6" offset..

B. Static Control Tile - Type SCT-1: Homogeneous; color and pattern throughout thickness.
   1. Manufacturers:
      a. Armstrong Flooring; Excelon SDT: www.armstrongflooring.com
      b. Flexco Corporation; Delane ESD Vinyl: www.flexcofloors.com/#sle.
      c. Mannington Commercial; _____: www.manningtoncommercial.com#sle.
      d. Roppe Corporation; ESD Vinyl Static Control Tile: www.roppe.com/#sle.
      e. Tarkett North America; Delane ESD Vinyl Tile: www.tarkett.com
   2. Minimum Requirements: Solid vinyl tile complying with ASTM F1700, Class 1, Type A.
   3. Electrical Resistance:
      a. Dissipative Tile: Resistance between 1.0 megohms and 1000 megohms as tested in accordance with ASTM F150.
   4. Tile Size: 12 by 12 inch (305 by 305 mm).
   5. Total Thickness: 0.125 inch (3 mm).
   6. Color: To be selected by Architect from manufacturer's full range.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Flexco Corporation: www.flexcofloors.com/#sle.

b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
c. Mannington Commercial: www.manningtoncommercial.com#sle.
d. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

2. Height: 4 inches (100 mm).
3. Profile:
   a. Coved at hard or resiliant tile flooring
   b. Straight at carpet
4. Thickness: 0.125 inch (3.2 mm).
5. Finish: Satin.
6. Length: Roll.
7. Color: As scheduled.
8. Accessories: Premolded external corners and internal corners.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Adhesive for Vinyl Flooring:
   1. As recomended by flooring manufacturer.

D. Moldings, Transition and Edge Strips: Rubber or vinyl.
   1. Manufacturers:
      a. Mannington Commercial: www.manningtoncommercial.com#sle.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.
   2. Colors: as selected from manufacturer's complete range.

E. Copper Grounding Strips: Type and size as recommended by static control flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 090561.
   2. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
   3. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install plank tile with a random offset of at least 6 inches (152 mm) from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.08 SCHEDULE

A. RB--1: Not Used

B. RB-2: Roppe 663 "Aged Fern"

C. RB-3: Roppe 188 "Brick"

D. RB-4: Roppe 178 "Pewter"

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

B. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2022.

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

E. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and _____.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Installer's Qualification Statement.

H. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Interface, Inc: www.interface.com/#sle.

2.02 MATERIALS

A. Tile Carpeting, Type CPT-1: Tufted, manufactured in one color dye lot.
   1. Tile Size: 19 1/2 by 19 1/2 inch (500 by 500 mm), nominal.
   2. Collection: Biodiversity
   3. Style: Broadleaf
   4. Color: 101995 "Prairie".
   5. Pattern: Quarter turn.
   6. Application: Field carpet

B. Tile Carpeting, Type CPT-2: Tufted, manufactured in one color dye lot.
   1. Tile Size: 19 1/2 by 19 1/2 inch (500 by 500 mm), nominal.
   2. Collection: Viva Colores
   3. Color: 101130 Aceitunado.
   4. Pattern: Quarter Turn.
   5. Application: Border/accent carpet.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, _____ color.

C. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 090561.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction alternating to next unit, set parallel to building lines.

F. Trim carpet tile neatly at walls and around interruptions.

G. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove excess adhesive without damage, from floor, base, and wall surfaces.

C. Clean and vacuum carpet surfaces.

END OF SECTION

This page intentionally left blank

SECTION 097200
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall covering and borders.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Preparation and priming of substrate surfaces.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

B. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on wall covering and adhesive.

C. Samples: Submit two samples of wall covering, ____by____ inch (____by____ mm) in size illustrating color, finish, and texture.

D. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

G. Installer's Qualification Statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Wall Covering Materials: 25 linear feet (8 linear m) of each color and pattern of wall covering; store where directed.

1.05 QUALITY ASSURANCE

A. 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. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 WALL COVERINGS

A. General Requirements:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

B. Wall Covering - Type VWC-1: Fabric-backed vinyl roll stock.
   1. Manufacturer: Momentum
   2. Application/Pattern: Wallcovering Halcyon

3. Product #/Color: ASL-127011 "Crystaline"
4. Installation: Reverse hang, random match

C. Wall Covering - Type VWC-2: Fabric-backed vinyl roll stock.
1. Manufacturer: Momentum
2. Application/Pattern: Tableau
3. Product #/Color: L2-TA-06 "Jungle"
4. Installation: Reversible pattern with a random match

D. Wall Covering - Type VWC-3: Fabric-backed vinyl roll stock.
1. Manufacturer: Momentum
2. Application/Pattern: Tableau
3. Product #/Color: L2-TA-11 "Garden"
4. Installation: Reversible pattern with a random match

E. Wall Covering - Type VWC-4: Fabric-backed vinyl roll stock.
1. Manufacturer: Momentum
2. Application/Pattern: Wallcovering Interlude WC
3. Product #/Color: A177-263 "Ivy"
4. Installation: Reverse hang, random match

F. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.

B. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet (3 mm in 3 m) nor vary at a rate greater than 1/16 inch/ft (1.5 mm/300 mm).

3.02 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

E. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

D. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

E. Butt edges tightly.

F. Horizontal seams are not acceptable.

G. Do not seam within 2 inches (50 mm) of internal corners or within 6 inches (150 mm) of external corners.

H. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

I. Do not install wall covering more than 1/4 inch (6 mm) below top of resilient base.

J. Cover spaces above and below windows, above doors, in pattern sequence from roll.

K. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

This page intentionally left blank

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Prime surfaces to receive wall coverings.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Glass.
   10. Acoustical materials, unless specifically indicated.
   11. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum _____ 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, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

B. Paints:
1. Base Manufacturer: Benjamin Moore.
2. PPG Paints: www.ppgpaints.com/#sle.
3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: As indicated in Color Schedule.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry units, and plaster.
1. Two top coats and one coat primer.
2. Top Coat Sheen:
   a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
   b. Eggshell: MPI gloss level 3; use this sheen for walls.
3. Primer: As recommended by top coat manufacturer for specific substrate.
4. Color(s): PT-1, PT-2, PT-3, PT-5, PT-6

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
   1. Medium duty applications include doors and door frames.
   2. Two top coats and one coat primer.
   3. Top Coat(s): Interior Alkyd, Water Based; MPI #157, 167, 168, or 169.
   4. Top Coat Sheen:
      a. Satin: MPI gloss level 4; use this sheen for door frames.
   5. Primer: As recommended by top coat manufacturer for specific substrate.
   6. Color(s): PT-4

PART 3 EXECUTION

3.01 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 or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Masonry:

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.

H. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

I. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

3.02 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 COLOR SCHEDULE

A. PT-1:
   1. Manufacturer: Sherwin Williams
   2. Product: Promar
   3. Color: SW6133 "Muslin"
   4. Finish: Egg shell for walls/ satin for convector covers

B. PT-2
   1. Manufacturer: Benjamin Moore
   2. Product: Aura Interior Paint
   3. Color: 2144-30 "Rosemary Spring"
   4. Finish: Egg shell

C. PT-3
   1. Manufacturer: Sherwin Williams
   2. Product: Promar
   3. Color: SW6320 "Bravado Red".
   4. Finish: Egg shell

D. PT-4
   1. Manufacturer: Sherwin Williams
   2. Product: Promar
   3. Color: 2135-40 "Province Blue"
   4. Finish: Egg shell

E. PT-5
   1. Manufacturer: Benjamin Moore
   2. Product: Aura Interior Paint
   3. Color: AC-27 "Galveston Gray"
   4. Finish: Satin

F. PT-6
   1. Manufacturer: Sherwin Williams
   2. Product: Promar
   3. Color: SW 7008 "Alibaster"
   4. Finish: Flat

END OF SECTION

SECTION 102113.17
PHENOLIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Phenolic toilet compartments.

B. Urinal and vestibule screens.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.

B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 3 by 3 inch (7.5 by 7.5 mm) in size illustrating panel finish, color, and sheen.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Product:
   1. ASI Global Partitions; "Black Core Phenolic"
   2. Color: "9842" Weathered Ash

B. Other Acceptable Manufacturers with similar products:
   1. All American Metal Corp - AAMCO: www.allamericanmetal.com/#sle.
   2. Bradley Corporation; "Phenolic Privacy Partitions": www.bradleycorp.com.
   3. Substitutions: Section 016000 - Product Requirements.

2.02 PHENOLIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted unbraced.

B. Doors:
   1. Thickness: 3/4 inch (19 mm).
   2. Width: 24 inch (610 mm).
   3. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
   4. Height: 58 inch (1473 mm).

C. Panels:
   1. Thickness: 1/2 inch (13 mm).
   2. Height: 58 inch (1473 mm).

D. Pilasters:

1. Thickness: 3/4 inch (19 mm).
2. Width: As required to fit space; minimum 3 inch (76 mm).

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets with vertical support/bracing same as compartments.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666 Type 304 stainless steel with No. 4 finish, 3 inch (76 mm) high, concealing floor fastenings.

B. Head Rails: Hollow anodized aluminum, 1 inch by 1-1/2 inch (25 mm by 38 mm) size, with anti-grip profile and cast socket wall brackets.

C. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

D. Hardware: Polished stainless steel:
1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
2. Door Latch: Slide type with exterior emergency access feature.
3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
4. Coat hook with rubber bumper; one per compartment, mounted on door.
5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 102600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Crash rails.

B. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking for wall and corner guard anchors.

B. Section 092116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, bumper rails, and protective corridor handrails, 24 inches (610 mm) long.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention, and _____.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Stock Materials: One package(s) of minimum 96 inches (2438 mm) long unit of each kind of covers for corner guards, bumper rails, and protective corridor handrails.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

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

C. Installer Warranty: Provide 5-year warranty for metal crash rails commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Crash Rails and Corner Guards:
   1. Construction Specialties, Inc; Acrovyn Solid Color and Chameleon Crash Rails: www.c-sgroup.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 PRODUCT TYPES

A. Crash Rails: Factory- or shop-fabricated, with preformed end caps and internal and external corners:
   1. Material: High impact vinyl, color as selected from manufacturer's standard colors.
   2. Mounting: Surface.
   3. Dimensions: Nominal 4" high by .75" deep.
   4. Model: SCR-40N

B. Corner Guards - Surface Mounted:
   1. Material: High impact vinyl with full height extruded aluminum retainer.
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
   3. Width of Wings: 3 inches (76 mm).
   4. Corner: 1/4" Radiused.
   5. Color: As selected from manufacturer's standard colors.
   6. Length: One piece.
   7. Preformed end caps.
   8. Model: SM-20N

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.04 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.

D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position top of bumper rail 36 inches (914 mm) from finished floor.

C. Position corner guard 4 inches (102 mm) above finished floor to ceiling.

D. Terminate rails 1 inch (25.4 mm) short of door openings and intersecting walls.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch (6 mm).

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch (6 mm).

3.04 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

3.05 SCHEDULE OF COLORS

A. Corner Guards
   1. CG-1
      a. Color: #920 "Almond"
      b. Location: install on all walls to receive wall covering VWC-1.
   2. CG-2
      a. Color: #1595 "Cucumber"
      b. Location: install on all walls to receive wall covering VWC-2.
   3. CG-3
      a. Color: #1584 "Mesa Red"
      b. Location: install on all walls to receive wall covering VWC-3.
   4. CG-4
      a. Color: #848 "Aspen"
      b. Location: install on all walls to receive wall covering VWC-4.

B. Crash Rails
   1. CR-1
      a. Color: #920 "Almond"
      b. Location: install on all walls to receive wall covering VWC-1.
   2. CR-2
      a. Color: #1595 "Cucumber"
      b. Location: install on all walls to receive wall covering VWC-2.
   3. CR-3
      a. Color: #1584 "Mesa Red"
      b. Location: install on all walls to receive wall covering VWC-3.
   4. CR-4
      a. Color: #848 "Aspen"
      b. ocation: install on all walls to receive wall covering VWC-4.

END OF SECTION

This page intentionally left blank

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Diaper changing stations.

1.02 RELATED REQUIREMENTS

A. Section 224000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 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 A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products; _____: www.ajw.com/#sle.
   2. American Specialties, Inc; _____: www.americanspecialties.com/#sle.
   3. Bradley Corporation; _____: www.bradleycorp.com/#sle.
   4. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide 4 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser (**TP-1**): Double jumbo roll, surface mounted.
   1. Products:
      a. American Specialties, Inc; model 0039: www.americanspecialties.com/#sle.
      b. Other acceptable manufacturers with similar products:.
         1) AJW Architectural Products: www.ajw.com/#sle.
         2) Bobrick Washroom Equipment, Inc.: www.bobrick.com
         3) Bradley Corporation: www.bradleycorp.com
      c. Substitutions: Section 016000 - Product Requirements.

B. Combination Towel Dispenser/Waste Receptacle (**PTD-1**): Recessed with projecting waste receptacle, stainless steel; seamless wall flanges, continuous piano hinges.
   1. Waste receptacle liner: Reusable, heavy-duty vinyl.
   2. Towel dispenser capacity: 600 C-fold.
   3. Waste receptacle capacity: 12 gallons (45 liters).
   4. Products:
      a. American Specialties, Inc; model 0469: www.americanspecialties.com/#sle.
      b. Other acceptable manufacturers with similar products:.
         1) AJW Architectural Products: www.ajw.com/#sle.
         2) Bobrick Washroom Equipment, Inc.: www.bobrick.com
         3) Bradley Corporation: www.bradleycorp.com
      c. Substitutions: Section 016000 - Product Requirements.

C. Soap Dispenser (**SD-1**): Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
   1. Minimum Capacity: 40 ounces (1.2 liters).
   2. Products:
      a. American Specialties, Inc; model 0347: www.americanspecialties.com/#sle.
      b. Other acceptable manufacturers with similar products:.
         1) AJW Architectural Products: www.ajw.com/#sle.
         2) Bobrick Washroom Equipment, Inc.: www.bobrick.com
         3) Bradley Corporation: www.bradleycorp.com

D. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick tempered safety glass; ASTM C1048.
   1. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   2. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
   3. Acceptable Manufacturers:
      a. AJW Architectural Products: www.ajw.com/#sle.
      b. American Specialties, Inc: www.americanspecialties.com/#sle.
      c. Bobrick Washroom Equipment, Inc.: www.bobrick.com
      d. Bradley Corporation: www.bradleycorp.com

E. Grab Bars: Stainless steel, peened surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
      b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
      c. Length and Configuration:
         1) **GB-1**: 42"
         2) **GB-2**: 36"
         3) **GB-3**: 18"
      d. Acceptable Manufacturers:

1) AJW Architectural Products: www.ajw.com/#sle.
2) American Specialties, Inc: www.americanspecialties.com/#sle.
3) Bobrick Washroom Equipment, Inc.: www.bobrick.com
4) Bradley Corporation: www.bradleycorp.com

e. Substitutions: Section 016000 - Product Requirements.

F. Purse Shelf (**S-1**): Fold-down, with spring-loaded hinge designed to automatically return shelf to vertical position when not in use; 0.03 inch (0.8 mm) satin-finished stainless steel, with 1/4 inch (6 mm) rolled or 1/2 inch (12 mm) channel edge at shelf front.

1. Products:
   a. American Specialties, Inc; model 0698: www.americanspecialties.com/#sle.
   b. Other acceptable manufacturers with similar products:.
      1) AJW Architectural Products: www.ajw.com/#sle.
      2) Bobrick Washroom Equipment, Inc.: www.bobrick.com
      3) Bradley Corporation: www.bradleycorp.com
   c. Substitutions: Section 016000 - Product Requirements.

G. Sanitary Napkin Disposal Unit (**SND-1**): Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

1. Products:
   a. American Specialties, Inc; model 0473-1: www.americanspecialties.com/#sle.
   b. Other acceptable manufacturers with similar products:.
      1) AJW Architectural Products: www.ajw.com/#sle.
      2) Bobrick Washroom Equipment, Inc.: www.bobrick.com
      3) Bradley Corporation: www.bradleycorp.com

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Specified in 224000 - Plumbing Fixtures.

2.06 DIAPER CHANGING STATIONS

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.

1. Material: Polyethylene with stainless steel face panel
2. Mounting: Surface.
3. Color: Gray.
4. Minimum Rated Load: 250 pounds (113.4 kg).
5. Products:
   a. Koala Kare Products, a division of Bobrick Corp, model KB300-SS: www.koalabear.com
   b. Substitutions: 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. See Section 061053 - Miscellaneous Rough Carpentry for installation of blocking in walls and ceilings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 122400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior motorized roller shades.

B. Motor controls.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 262726 - Wiring Devices: Finish requirements for wall controls specified in this section.

1.03 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

B. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute; Current Edition.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.

B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

C. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams for specified products.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
   1. Motorized Shades: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.

D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

F. Selection Samples: Include fabric samples in full range of available colors and patterns.
   1. Motorized Shades: Include finish selections for controls.

G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

J. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.
   2. Electric Motors: One year.
   3. Electronic Control Equipment: One year.
   4. Fabric: One year.
   5. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Motorized Roller Shades, Motors and Motor Controls:
   1. Draper, Inc; Motorized FlexShade: www.draperinc.com/#sle.
   2. Hunter Douglas Architectural; RB500 Motorized Roller Shades: www.hunterdouglasarchitectural.com/#sle.
   3. MechoShade Systems LLC; UrbanShade Single Roller - Motorized: www.mechoshade.com/#sle.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades:
   1. Description - Interior Roller Shades: Double roller, motor operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Roll Direction: Roll down, closed position is at window sill.
      c. Mounting: Recess mounted in ceiling pocket.
      d. Fabric: As indicated under Shade Fabric article.

2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
    a. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
3. Roller Tubes: As required for type of shade operation.
    a. Material: Extruded aluminum, clear anodized finish.
    b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
4. Hembars: Designed to maintain bottom of shade straight and flat.
    a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.

2.03 SHADE FABRIC

A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Material: Thermoplastic olefin (TPO).
2. Performance Requirements:
    a. Flammability: Pass NFPA 701 large and small tests.
    b. Fungal Resistance: No growth when tested according to ASTM G21.
3. Roll Width: largest practical width as required to minimize number of rolls. Field verify.
4. Color: As selected by Architect from manufacturer’s full range of colors.

B. Fabric for Room-Darkening Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Material: Vinyl coated polyester.
2. Performance Requirements:
    a. Flammability: Pass NFPA 701 large and small tests.
    b. Fungal Resistance: No growth when tested according to ASTM G21.
3. Roll Width: largest practical width as required to minimize number of rolls. Field verify.
4. Color: As selected by Architect from manufacturer’s full range of colors.

2.04 MOTOR CONTROLS

A. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.

B. Provide all components and connections necessary to interface with other systems as indicated.

C. Manual Controls:
1. Control Functions:
    a. Open: Automatically open controlled shade(s) to fully open position when button is pressed.
    b. Close: Automatically close controlled shade(s) to fully closed position when button is pressed.
2. Wall Controls: Provided by shade manufacturer.
    a. Finish: As specified in Section 262726.
    b. Button Engraving: Manufacturer's standard engraving, unless otherwise indicated.

2.05 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
2. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

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

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

D. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.07 PROTECTION

A. Protect installed products from subsequent construction operations.

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

3.08 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, a proposal as an alternate to the base bid, a separate renewable maintenance contract for the service and maintenance of a motorized shade system for one year from date of Substantial Completion. Include a complete description of preventive maintenance, systematic examination, adjustment, parts and labor, cleaning, and testing, with a detailed schedule.

END OF SECTION

SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall panels for architectural cabinet work.

C. Sinks molded into countertops.

1.02 RELATED REQUIREMENTS

A. Section 064100 - Architectural Wood Casework.

B. Section 224000 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

F. PS 1 - Structural Plywood; 2019.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.

5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

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

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD 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 absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Basis of Desing Product: Dupont; Corian: www.corian.com
      a. Other acceptable Manufacturers with similar products:
         1) Formica Corporation; _____: www.formica.com/#sle.
         2) LG Hausys America, Inc; HI-MACS 12mm: www.lghausysusa.com/#sle.
         3) Wilsonart: www.wilsonart.com/#sle.
   2. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
   3. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   4. Other Components Thickness: 1/2 inch (12 mm), minimum.
   5. Exposed Edge Treatment: Built up to minimum 1-1/4 inch (32 mm) thick; square edge; use marine edge at sinks.
   6. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.
      a. Provide full height back splashes where indicated on the drawings.
   7. Molded Lavatories and Sinks:
      a. Refer to Mechanical drawings for the locatoin of all molded lavatories and sinks.
      b. Basis of Design Product: Match Corian model profiles as schedulled below:
         1) LAV-2: "Chic 7412"
         2) SK-1: "Simplicity 881P"
         3) SK-2: "Accessible 5610"
         4) SK-3: "Accessible 5610"
         5) SK-4: "Neat 804P".
      c. Color: To be selected from manufacturer's available range.
   8. Skirts: As indicated on drawings.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.

2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches (102 mm), unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches (3,657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

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. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.03 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.04 CLEANING

A. Clean countertops surfaces thoroughly.

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 SCHEDULES

SS-1: Corian "windswept Prima"

SS-2: Not used

SS-3: Not Used

SS-4: Corian "Doeskin"

END OF SECTION

SECTION 21 0001
GENERAL FIRE SUPPRESSION & FIRE PROTECTION REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Division includes all labor, materials, equipment, tools, supervision, etc., including all incidental and related items, necessary to complete installation and successfully test and start up and operate the Fire Suppression (Wet Pipe = F.S.) / Fire Protection (Clean Agent = F.P.) systems indicated on the drawings, AND as described in each Section of Division 21 0000 Specifications.

B. All drawings and General Provisions of the Contract, including the General Conditions, Supplementary General Conditions, and Division 1 specification sections, apply to work of all Division 21 sections. The items in this section are not intended to supersede, but are supplementary to, the requirements set forth in other Divisions of the specifications.

C. The Contractor, and his Subcontractors and Suppliers, shall include in their bid all materials, labor, and equipment involved, in accordance with all local customs, codes, rules, regulations; and secure compliance of all parts of the Specifications and Drawings regardless of Sectional inclusion in these Specifications.

D. The Contractor shall be held responsible for the complete and satisfactory accomplishment of all Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation, and demonstrate that all fire protection systems will operate satisfactorily under normal operating conditions.

1.02 DRAWINGS & SPECIFICATIONS

A. The drawings are diagrammatic and show the general location and arrangement of equipment, piping and related items. They shall be followed as closely as elements of the construction will permit. The Contractor shall provide/install all fire protection systems, and associated equipment, complete and include all necessary offsets, fittings, and other components required due to interferences, space constraints, code requirements, etc. as required to provide a complete/functional system.

B. The general fire suppression/protection requirements are intended to augment the drawings and specifications. Should conflicts occur between the drawings and the specifications, the strictest provision shall govern. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect and/or Engineer for resolution.

C. The Contractor shall examine the drawings of all other trades in order to verify the conditions governing the work on the job site. Arrange work accordingly, providing all piping, fittings, valves and accessories as may be required to meet such conditions.

D. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect and/or Engineer.

E. The architectural and structural drawings take precedence in all matters pertaining to the building structure, plumbing drawings in all matters pertaining to plumbing trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect and/or Engineer for resolution.

1.03 COORDINATION OF WORK

A. The Contractor and his Subcontractors shall be responsible for all tasks applicable to their work in accordance with the Specifications, Drawings, and code requirements, and shall be

responsible for coordinating locations and arrangements of their work to give best results with all other relevant trades.

1. Coordinate his work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, etc. are coordinated and are installed per the Architectural reflected ceiling plan.
2. Coordinate all wall, roof, floor penetrations, equipment pads, etc. with architectural and structural trades.
3. Refer to architectural floor plans for locations/heights/types of ceilings, structural elements, etc. Coordinate with architectural plans for details on where fire protection piping will be routed, sprinkler head locations, etc.
4. Verify requirements of all equipment with shop drawing submittals prior to installation - notify Architect/Engineer of any conflicts between shop drawings and plans.
5. Coordinate locations of fire protection items that require access (i.e. isolation valves, test valves, etc.) with reflected ceiling plan. Items located above hard non-accessible ceilings shall be provided with access doors as required.
6. Verify clearance requirements of all mechanical, electrical and plumbing equipment/systems prior to the installation of any new work. Fire protection equipment, piping, systems, etc. shall not interfere with mechanical, electrical, and plumbing equipment spaces.

1.04 INSPECTION OF SITE AND PROJECT DOCUMENTATION

A. The Contractor shall visit the site and examine/verify the conditions under which the work must be conducted before submitting proposal. The Contractor shall examine the drawings and specifications of all other trades including Mechanical, Architectural, Structural and Electrical.

B. The Contractor shall visit the project site, examine all contract documents, and understand the conditions under which the work must be conducted.

C. The Contractor shall notify the Architect and/or Engineer, prior to submitting his bid via Request For Information (RFI), of any potential problems that he has identified during his inspection of the site or from the review of plans/specifications. RFIs must be submitted at least 5 working days prior to bid opening.

1.05 GENERAL SUPPORT REQUIREMENTS

A. Provide all necessary angle/brackets, hangers, or supplementary supporting steel as required for adequate support for all piping, and equipment. Secure approval form Architect and/or Structural Engineer, in writing, before welding or bolting to steel framing or anchoring to concrete structure, or cutting/coring thru structural systems.

B. Where piping or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

C. Install fire protection systems with adequate anchors, guides, expansion loops, etc. as required to provide for piping expansion/contraction.

1.06 GUARANTEE

A. Contractor shall guarantee that all labor, materials, and equipment are free from defects and agrees to replace or repair any part of this installation which becomes defective within a period of one year from the date of substantial completion following final acceptance. Acceptance date of substantial completion shall be as determined by the Architect and/or Engineer.

B. The Contractor shall file with the Owner any and all guarantees from the equipment manufacturers including the operating conditions and performance capacities they are based on.

1.07 CODES, PERMITS AND FEES

A. Refer to Division 1, General Conditions and Supplementary Conditions.

B. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for mechanical work shall be secured and paid for by the Contractor.

C. All work shall be executed in accordance with the latest enforceable rules and regulations set forth in local and state codes.

1. Fire Protection systems shall be installed per current jurisdictional codes (i.e. Michigan Mechanical Code, Michigan Plumbing Code, etc.), current NFPA codes (i.e. NFPA 13, NFPA 14, NFPA 101, NPFA 90, etc.), and applicable sections of the Michigan Building Code.

D. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.

E. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

F. Contractor shall prepare any detailed shop drawings and diagrams that are required by the governing authorities (i.e. fire protection plans, fire protection calculations, etc.).

1.08 UTILITIES

A. The Contractor shall be responsible for coordinating, obtaining service, and advising the Engineer, and utility company(s) for the fire protection water service installation.

B. Rules of local utility companies shall be complied with.

C. In the event that the plans and specifications conflict with any utility rules, regulations, or codes applying, said utility rules, regulations and codes shall govern.

1.09 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

A. Provide compete maintenance and operating instructional manuals covering all fire protection equipment as specified herein, Division 1 requirements, and individual equipment specification sections.

B. The O&M data shall be bound in a suitable number of 3" or 4", 3-ring, hard cover binders. Permanently imprinted on the cover shall be the words, "Manufacturer's Operation and Maintenance Data", project title, location of project, and the date. A table of contents shall be provided in the front of each binder.

C. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Each piece of equipment in the O&M manual shall be identified as identified on the project drawings (i.e. Backflow Preventers, Sprinkler Heds, etc.).

D. Internally subdivide the binder contents with permanent page dividers, organized by specification section and/or major equipment/systems (i.e. Fire Protection Sprinklers, Fire Pump, etc.)

E. Contents: Each volume of O&M manual shall have three parts:

1. Part 1: A directory listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: O&M data, arranged and subdivided by major equipment/systems. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers:

a. List of equipment.

b. Copies of Shop drawings and product data, approved by Architect/Engineer.

c. Installation and operational procedures.

d. Routine maintenance procedures.

e. Trouble shooting procedures.

f. Complete parts lists by nomenclature, manufacturer's part number and use.

g. Recommended spare parts lists.

h. Complete wiring and schematic diagrams.

i. Elevations and/or sections cut through all of the major equipment and sub-assemblies.

3. Part 3: Project documents and certificates, including the following: Shop drawings.

a. Warranty Certificates.

b. Contractor's and equipment manufacturer's telephone numbers for warranty repair services.

c. Copies of approved construction permits.

F. Maintenance and Operating manuals shall be provided to the Architect and/or Engineer for review when construction is 75% complete.

G. A minimum of two (2) copies of all approved Operation and Maintenance literature shall be furnished to the Owner within 10 days after final inspection. O&M manuals must be completed prior to start of Owner training as the manuals shall be used as the basis of the training.

1.10 SHOP DRAWINGS/SUBMITTALS

A. Refer to General Conditions and Supplementary General Conditions.

B. All shop drawings shall be submitted in groupings of similar and/or related items. Incomplete submittal groupings will be returned unchecked.

C. Submit fire protection system shop drawings, product data and hydraulic calculations to local Authorities Having Jurisdiction, the Owner's insuring agency, and the Architect and/or Engineer for approval prior to fabrication or installation. Submit proof of approval from the Authority Having Jurisdiction to Architect and/or Engineer.

D. Unless noted otherwise, submit digital (.pdf format) copies of complete manufacturer's shop drawings for all equipment, valves, specialties, pipe hangers, wiring diagrams and control diagrams including, but not limited to the items listed below. Where items are referred to by symbolic designation on the drawings and specifications, all submittals shall bear the same designation. Refer to other Sections of the fire protection specifications for additional requirements.

1. 21 0500 Common Work Results For Fire Suppression.

a. Fire Protection System Equipment and Specialties.

2. 21 1300 Fire-Suppression Sprinkler Systems.

a. Fire Protection Sprinklers.

b. Fire Protection Piping Layouts.

c. Fire Protection Calculations.

1.11 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection the Contractor shall instruct Owner's designated personnel in operation, adjustment and maintenance of mechanical equipment and systems at agreed upon times. A minimum of 8 hours of formal instruction to Owner's personnel shall be provided for each building. Additional hours are specified in individual specifications sections.

B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

C. Use Operation and Maintenance Manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.12 RECORD DRAWINGS

A. Contractor shall submit to the Architect and/or Engineer, record drawings which have been neatly marked to represent as-built conditions for all new fire protection work.

B. The Contractor shall keep accurate note of all deviations from the construction documents and discrepancies in the underground concealed conditions and other items of construction on field drawings as they occur. The marked up field documents shall be available for review by the Architect and/or Engineer, and Owner at their request.

1.13 HAZARDOUS CONDITIONS

A. Prior to starting work in any hazardous condition area, obtain approval for doing so from a qualified representative of the Owner who is designated and authorized by the Owner to perform testing and abatement, if necessary, of all hazardous materials including, but not limited to, asbestos, PCB, etc.. The Contractor shall visit the site prior to construction and indicate to the Owner's representative the areas that may need testing and abatement (i.e. existing pipes that need renovating, boilers that need removal, etc.). The Contractor shall not perform any inspection, testing, containment, removal or other work that is related in any way whatsoever to hazardous materials under the contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. Install equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the Architect and/or Engineer for resolution.

3.02 WORK INVOLVING OTHER TRADES

A. Certain items of equipment or materials specified in the Fire Protection Division may have to be installed by other trades due to code requirements or union jurisdictional requirements. In such instances, the Contractor shall complete the work through an approved, qualified subcontractor and shall include the full cost for same in his bid.

3.03 COORDINATION

A. Install work to avoid interference with work of other trades including, but not limited to, architectural and electrical trades. Remove and relocate any work that causes an interference at Contractor's expense. Disputes regarding the cause of an interference shall be resolved by the Architect and/or Engineer.

3.04 CHASE, SHAFTS AND RECESSES

A. Coordinate with structural, architectural and other trades to ensure accurate location and size of chases, shafts and recesses required for fire protection systems/piping.

3.05 SLEEVES

A. Provide and install Schedule 40 black steel pipe sleeves, cut to length, wherever pipes pass through above grade walls and floors. Provide and install galvanized steel pipe sleeves, cut to length, wherever pipes pass through below grade foundation walls and slab on grade floors. Sleeves shall terminate flush with walls in finished areas. All sleeves through the floor are to extend two (2) inches above finish floor.

B. Provide escutcheons at each penetration through walls, floors, and ceilings in exposed areas.

C. Patch sleeves to match building material.

3.06 SEALING OF FIRE PROTECTION OPENINGS

A. Seal the space around pipes and sleeves through walls, floors and ceilings.

B. Refer to specification 078400-Firestopping.

C. Provide adequate clearance to allow for proper pipe movement and sealing.

D. Provide/install fireproof wall and floor sleeves as required by applicable building codes at all applicable wall, ceiling, and floor penetrations. Refer to Architectural plans for wall assembly ratings.

E. Sleeves placed in floors shall be flush with the underside of the floor construction and shall have planed, square ends, extending 2 inches above the finished floor, unless otherwise noted or detailed.

F. Where sleeves pass through reinforced concrete floors, they shall be properly set in position prior to concrete pouring in such a way that they will be maintained in position until the concrete is set.

G. Pipes passing through below grade perimeter walls or slabs on grade shall have the space between the pipe and sleeve sealed watertight with a mechanically expandable elastomer seal device.

H. Penetrations through fire rated floors and walls shall be firestopped per applicable building code requirements with UL and FMRC approved materials and shall have a fire rating equal to or greater than the fire partition rating. Refer to architectural plans for locations and assembly ratings.

1. Packing: Refractory fiber or ceramic fiber.
    a. Manufacturers:
        1) Carborundum Fiberfrax.
        2) Johns-Manville - Cerafelt.
        3) Eagle Picher Epitherm 1200.
        4) Babcock and Wilcox Kaowool.
2. Fire stop sealant.
    a. Manufacturers:
        1) Hilti
        2) Tremco
        3) Mameco
        4) Pecora
3. For polypropylene (Acid Waste/Acid Vent piping) penetrations through fire rated assemblies, provide an intumescent firestop.
    a. Hilti CP 642 Firestop Collar.
    b. Hilti FS-ONE High Performance Intumescent Firestop Sealant.
    c. 3M Fire Barrier PPD Plastic Pipe Device.
    d. 3M Fire Barrier Intumescent Firestop Sealant.
4. Where combustible pipes, tubes, vents, etc. penetrate a fire rated assembly, such penetrations shall be protected by an approved through-penetration fire stop collar/sealant system per the building code.
    a. Through -penetration firestop systems shall be tested in accordance with ASTM E814

with a minimum positive pressure differential of 0.01 inch WG. Through penetration firestop systems shall have a "F" rating and a "T" rating of not less than 1 hour but not less than the required rating of the assembly penetrated.

b. Hilti CP 642 Firestop Collar.

c. Hilti FS-ONE High Performance Intumescent Firestop Sealant.

d. 3M Fire Barrier PPD Plastic Pipe Device.

e. 3M Fire Barrier Intumescent Firestop Sealant.

3.07 CUTTING, CORING AND PATCHING

A. Refer to General Conditions

B. The Contractor shall perform all cutting, coring, and patching that may be necessary for the installation of their Work. All cutting, coring, patching and repair work shall be performed by the Contractor through qualified Subcontractors. Contractor shall include full cost of same in his bid.

C. Secure approval form Architect and/or Structural Engineer, in writing, before cutting, welding/bolting to, or anchoring from any structural building components (i.e. structural steel, load bearing walls, footings/foundations, concrete floors/ceilings, etc.).

3.08 EQUIPMENT CONNECTIONS

A. Make connections to equipment, pumps, and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufactures of the particular equipment furnished.

B. All piping connections to equipment shall be flanged or shall be made with unions to facilitate equipment removal.

C. All piping connections to pumps other equipment shall be installed without strain at the pipe connection of this equipment.

D. Brass unions for connections of 2 inch and less and flanged union with dielectric gasket and bolt sleeves for 2-1/2 inch and greater shall be used for equipment connections of dissimilar metals.

3.09 ACCESSIBILITY

A. All equipment shall be installed so as to be readily accessible for operation, maintenance, and repair, as required by the equipment manufacturer and as subject to the approval of the Engineer.

3.10 CLEANING

A. Each trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.

B. After equipment and systems have been completed and tested, each entire system shall be cleaned and flushed.

C. Prior to connection of new piping to existing piping systems, all new piping shall be subject to initial flushing, cleaning and final flushing. Provide temporary bypass piping and fittings, temporary valves and strainers, temporary water make-up piping with approved means of backflow prevention, and temporary pumps as needed to perform specified flushing and cleaning requirements.

3.11 PAINTING

A. All fire protection systems, equipment, piping, etc. exposed in finished areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect.

3.12 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Electrical equipment furnished by Fire Protection Trades and installed by Electrical Trades shall be turned over to Electrical Trades in good condition.

B. Equipment and materials shall be protected from theft, injury or damage.

C. Coat polished or plated metal parts with white petroleum jelly immediately after installation.

D. Protect equipment outlets, pipe openings with temporary plugs or caps.

E. Provide adequate storage for all equipment and materials delivered to the job site. Equipment set in place in unprotected areas must be provided with temporary protection.

3.13 GENERAL SUPPORT REQUIREMENTS

A. Each trade shall provide all required supporting components to properly support their work. Supporting components/systems shall be in accordance with Code and as specified.

B. Provide all necessary angle/brackets or supplementary steel as required for adequate support for all piping, valves, specialties, and equipment. Secure approval form Architect and/or Structural Engineer, in writing, before welding or bolting to steel framing or anchoring to concrete structure.

C. Where piping, specialties, or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

3.14 PIPING SYSTEMS TESTING

A. Test backflow prevention at connections between potable water and nonpotable water for proper functioning under normal operating conditions. Provide Owner with one (1) copy of the potable water backflow prevention test report.

B. Test drainage piping systems in accordance with their respective and applicable governing codes. Test drainage and waste piping hydraulically by filling the system to its highest point or at a static head of 10 feet, whichever is higher.

C. Pressure test fire protection piping in accordance with governing and applicable codes. At minimum, test with water at 200 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

3.15 DRAWINGS AND MEASUREMENTS

A. These specifications and accompanying drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either the drawings or specifications shall be as binding as if call for by both. The work herein described shall be complete in every detail.

B. The Drawings are not intended to be scaled for rough-in measurements, nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor. The Contractor shall check latest architectural drawings to locate equipment/fixtures/etc., check latest structural drawings for interferences, etc..

3.16 EXTRA WORK

A. For any extra work which may be proposed, the Contractor shall furnish to the General Contractor/Construction Manager, an itemized breakdown of the estimated cost of all materials and labor required to complete this work. The estimate cost breakdown shall include unit prices (same prices for increase/decrease of work) for all materials (i.e. duct, piping, valves, equipment, equipment rental, etc.) and all labor (i.e. manhours, overtime, etc.) which may be required for any proposed extra work. The Contractor shall not proceed until receiving a written order from the General Contractor establishing the agreed price and describing the work to be done.

3.17 DEMOLITION WORK

A. All demolition of existing fire protection equipment and materials shall be done by the Contractor unless otherwise indicated. Included are all items such as, but not limited to, existing piping, pumps, supports and equipment where such items are not required for the proper operation of the modified system.

B. In general, demolition work is indicated on the drawings. However, the Contractor shall visit the job to determine the full extent and character of this work.

C. Unless specifically noted to the contrary, removed materials shall not be reused in the work. Salvaged materials that are to be reused shall be stored safe against damage and turned over to the appropriate trade for reuse. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived. Remove items from the systems and turn over to the Owner in their condition prior to removal. The Owner shall move and store these materials. Items on which the Owner waives ownership shall become the property of the Contractor, who shall remove and legally dispose of, away from the premises.

D. Work that has been cut or partially removed shall be protected against damage until covered by permanent construction.

E. Clean and flush the interior and exterior of all existing relocated equipment and its related piping, valves, and accessories that are to be reused of all mud, debris, pipe dope, oils, welding slag, loose mill scale, rust and other extraneous material so that the existing equipment and all accessories can be repainted and repaired as required to place in first-class working condition.

F. Where existing equipment is to be removed, cap piping under floor, behind face of wall, above ceiling or at mains.

3.18 PIPING INSTALLATION IN PLENUM SPACES

G. Pipe and pipe fittings installed in mechanical air plenum spaces shall of non-combustible materials. If PVC piping is specified as an approved material, it shall be wrapped with at least 1.5 inches of non-combustible insulation plus continuous vapor barrier which meet building code required smoke and flame spread ratings.

H. Coordinate location of mechanical plenum spaces with electrical trades for plenum rated cable requirements.

3.19 WORK IN EXISTING BUILDINGS

A. The Owner will provide access to existing buildings as required. Access requirements to occupied buildings shall be identified on the project schedule. The Contractor, once work is started in the existing building, shall complete same without interruption so as to return work areas as soon as possible to Owner.

B. Adequately protect and preserve all existing and newly installed work. Promptly repair any damage to same at Contractor's expense.

C. Consult with the Architect and/or Engineer as to the methods of carrying on the work so as not to interfere with the Owner’s operation any more than absolutely necessary. Accordingly, all service lines shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the Architect and/or Owner's Representative.

END OF SECTION

SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION & FIRE PROTECTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler, standpipe and fire hose, and combination sprinkler and standpipe systems.

1.02 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers.

C. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers.

D. ASME B16.5 - Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers (ANSI/ASME B16.5).

E. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers.

F. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A 135/A 135M - Standard Specification for Electric-Resistance Welded Steel Pipe.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel.

I. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association (ANSI/AWWA C105/A21.5).

J. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association.

K. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; National Fire Protection Association.

L. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc..

M. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc..

N. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

C. Project Record Documents: Record actual locations of components and tag numbering.

D. Operation and Maintenance Data: Include installation instructions and spare parts lists.

E. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and shall be specifically identified with the applicable style or series designation.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years experience.

C. Conform to UL and FM requirements.

D. Valves: Bear UL and FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

F. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single ISO-9001 certified manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

G. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

H. The Fire Protection Contractor shall design and install the fire protection system under direct supervision of a Professional Fire Protection Engineer experienced in design of this type of work and licensed in the State of Michigan. The fire protection design drawings shall bear the seal/signature/date of the Professional Fire Protection Engineer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.01 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA 13, or NFPA 13R where allowed by code.

B. Standpipe and Hose Systems: Conform to NFPA 14.

C. Welding Materials and Procedures: Conform to ASME Code.

2.02 ABOVE GROUND SPRINKLER PIPING (F)

A. Steel Pipe: ASTM A 53 Schedule 40 or ASTM A 135 Schedule 10, black.

1. Steel Fittings: ASME B16.9, wrought steel, buttwelded or ASME B16.5, steel flanges and fittings.

2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.

3. Mechanical Grooved Couplings: Ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, electroplated steel bolts, nuts, and washers; galvanized for galvanized pipe.

a. Rigid Type: Housings shall be cast with offsetting angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with NFPA-13. (Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue and recess type couplings, or any coupling that requires exact gapping of bolt pads on each side of the coupling at specific torque ratings, are not allowed).

1) 1-1/4" through 4": Installation ready couplings, for direct stab installation without field disassembly. Victaulic Style 009-EZ (or approved equal).

2) 5" through 8": Victaulic FireLock Style 005 (or approved equal).

3) 10" and larger: Victaulic Zero-Flex Style 07 (or approved equal).

b. Flexible Type: For use in locations where vibration attenuation and stress relief are required, and for seismic applications in accordance with the manufacturer's written instructions. Victaulic Style 77.

c. Gasket Guide:

1) Dry Systems (Ambient Temperature Range) - Use FlushSeal®, Grade EPDM, Type A gasket.

2) Freezer Applications (-30 degrees F to 0 degrees F) - Use FlushSeal®, Grade L, Silicone gasket.

3) Water/Wet Systems (Ambient Temperature Range) - Use Grade EPDM, Type A gasket.

4. Mechanical Formed Fittings: Carbon steel housing (zinc electroplated exterior) with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe. UL listed and FMG approved to 175 psig CWP. Victaulic Pressfit® (or approved equal).

B. Pre-action and Dry type system piping and fittings shall be schedule 40 galvanized steel.

C. Antifreeze loop system piping and fittings downstream of fill cup shall be schedule 40 galvanized steel.

D. Minimum System Pressure Rating: 175 psig.

E. Isolation valves:

1. Outside stem and yoke gate valves (OS&Y). Victaulic Series 771 (or approved equal).

2. Grooved end butterfly valves with weatherproof actuator. Victaulic Series 705W (or approved equal).

2.04 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

H. In grooved installations, use Victaulic Style 009, 005, or 07 (or approved equal) rigid couplings with offsetting angle-pattern bolt pads, which permit support and hanging in accordance with NFPA-13.

2.05 GATE VALVES

A. Up to and including 2 inches:

1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 inches:

1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged ends, with backseating capacity (repackable

under pressure).

2. Ductile iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, EPDM coated cast iron wedge, grooved ends, with backseating capacity (repackable while in line). Victaulic Series 771 (or approved equal).

C. Over 4 inches:

1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2. Iron body, bronze trim, non-rising stem with bolted bonnet, EPDM coated cast iron wedge, grooved ends, iron body indicator post assembly. Victaulic Series 772 valve with Series 773 wall post (or approved equal) or Series 774 upright post (or approved equal).

2.06 BALL VALVES

A. Up to and including 2 inches:

1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded or soldered ends with union.

2. Bronze two piece body, brass, chrome plated brass ball, teflon seats and stuffing box ring, weatherproof actuator with handwheel and two single-pole double-throw supervisory switches, threaded or grooved ends. Victaulic Series 728 (or approved equal).

B. Over 2 inches:

1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

2. Ductile iron body, chrome plated steel ball, TFE seat, fluoroelastomer seals, lever handle or gear operated, with grooved ends. (unlisted) Victaulic Series 726 (or approved equal).

2.07 BUTTERFLY VALVES

A. Bronze Body:

1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

B. Cast or Ductile Iron Body

1. Cast or ductile iron, 2-1/2 inch and larger body, bronze disc, stainless steel stem, resilient replaceable EPDM seat (for service not less than 250 degrees F), full lug type body to fit between ANSI class 150 flanges, extended neck, bronze bearings on upper and lower shafts, position indicators and memory stops. Provide lever operator (10 position) for sizes through 4 inches and lubricated enclosed screw or worm gear operator for larger sizes. Valves shall be bubble tight against maximum expected external pressure differential and shall be capable of deadend, and internal tamper switch rated 10 amp at 115 volt AC.

C. Ductile Iron Grooved End Body

1. Ductile iron, 2-1/2 inch and larger body, EPDM coated ductile iron disc with integrally cast stem (for service to 230 degrees F), grooved end body for installation with couplings of the same manufacturer, stainless steel backed Teflon impregnated fiberglass bearings, 416 stainless steel stem nuts, EPDM O-ring, with weatherproof actuator and two single-pole double-throw supervisory switches rated 10 amp at 125 volt AC. Victaulic Series 705W (or approved equal).

2.08 DRAIN VALVES

A. Compression Stop:

1. Bronze with hose thread nipple and cap.

B. Ball Valve:

1. Brass with cap and chain, 3/4 inch hose thread.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with Mechanical Grooved Couplings (Victaulic or approved equal), flanges or unions.

3.02 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13, Owner's Insuring Agency requirements, and requirements of local authorities having local jurisdiction.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Sleeve pipes passing through partitions, walls, and floors.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

1. For water systems, use adequate numbers of Victaulic Style 75 or 77 (or approved equal) flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with manufacturer’s instructions) Where expansion loops are required, use flexible couplings on the loops.

G. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

H. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

2. Place hangers within 12 inches of each horizontal elbow.

3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

6. Prime coat exposed steel hangers and supports. Refer to Section 09 9000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not

considered exposed.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09 9000.

K. Do not penetrate building structural members without coordination with/approval from Structural Engineer.

L. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

N. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

P. Provide gate or butterfly valves for shut-off or isolating service.

Q. Provide drain valves at main shut-off valves, low points of piping and apparatus. Drain to floor drains via air gap, refer to plumbing plans for floor drain locations (coordinate with plumbing trades).

R. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. Note: A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).

S. Install Victaulic Pressfit® (or approved equal) in accordance with manufacturer's recommendations. Pipe shall be square cut (+/-0.030", properly deburred, and cleaned. Pipe ends shall be marked with a gauge supplied by the manufacturer. Use a Victaulic 'PFT' series (or approved equal) tool with the proper sized jaw for pressing.

T. Provide vents, with manual vent valves, at all high points in the system. Purge all air from the system during start-up.

END OF SECTION

SECTION 21 0553

IDENTIFICATION FOR FIRE SUPPRESSION (F.S.) & FIRE PROTECTION (F.P.) PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc.: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with

sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify control panels and major control components outside panels with plastic nameplates.

F. Identify valves in main and branch piping with tags.

G. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 21 1300

FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance Based System design, installation, and certification.

1.02 REFERENCE STANDARDS

A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.

B. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.

C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.

D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

E. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Shop Drawings for wet pipe sprinkler systems, standpipe and fire hose systems, and sprinkler systems:

1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.

2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.

3. Submit shop drawings, product data, and hydraulic calculations to authority having jurisdiction, and Fire Marshall for approval. Submit proof of approval to ENGINEER and/or OWNER.

4. All Fire Suppression shop drawings and calculations shall be prepared by a licensed Professional Fire Protection Engineer experienced in design of this type of work and bear the Professional Fire Protection Engineer's PE seal/signature.

5. All drawings shall be prepared as .dxf or .dwg CAD drawings.

C. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.04 QUALITY ASSURANCE

A. The Design-Build Fire Suppression Contractor (F.S.) shall design and install the fire protection system under direct supervision of a Professional Fire Protection Engineer experienced in design of this type of work and licensed in State of Michigan. All shop drawings and calculations shall be prepared by a licensed Professional Fire Protection Engineer experienced in design of this type of work and bear the Professional Fire Protection Engineer's seal/signature.

B. Conform to UL requirements.

C. All equipment and components shall be FMRC approved and shall bear FMRC labels or markings.

D. Perform design and work in accordance with NFPA 13, FMRC data sheets, and other applicable NFPA requirements, and Owner's insurance requirements (if applicable).

E. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

F. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years experience.

G. Equipment and Components: Provide products that bear UL label or marking.

H. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.05 HYDRAULIC DESIGN CRITERIA

A. Locate risers as indicated on the plans, full size from flange above finished floor to feed the main.

B. Hydraulic calculations shall begin at outlet connection of the city water meter or connection into the distribution system with pipe friction based upon Hazen-Williams coefficients.

C. Perform design and work in accordance with NFPA 13, FMRC data sheets, and other applicable NFPA requirements, and Owner's insurance requirements (if applicable).

D. Design-Build Fire Suppression Contractor (F.S.) shall verify existing pressure/flow parameters with local water supply utility, and make pressure and flow tests to determine the available water supply parameters.

E. Water velocity in the piping shall not exceed the following criteria:

1. Underground mains: 16 ft./sec.
2. Aboveground mains: 32 ft./sec. 20 ft./sec. if Owner's Insurance Agency is FMRC.
3. Sprinkler branch lines: 32 ft./sec. 20 ft./sec. if Owner's Insurance Agency is FMRC.

F. Base hydraulic calculations on maximum density for each sprinklered area, plus hose allowances required, plus 15% unbalance for each area, starting from the outlet connection through the loop of each zone.

G. Provide inspector's test connections per NFPA 13 and FMRC Data sheet 2-8N. Locate as indicated on the drawings, or as required.

1.06 REGULATORY REQUIREMENTS

A. Hydraulic calculations, product data and shop drawings shall bear stamp of approval of local Authorities having jurisdiction and the Owner's Insurance Underwriter.

B. Conform to NFPA 13 for installation and testing of sprinkler systems.

C. Conform to NFPA 14 for installation and testing of standpipe systems.

D. Conform to FMRC Data sheet 2-8N, 4-4N, and 3-7N.

E. The provisions and requirements of the NFPA and/or the Owner's insurance underwriter constitute mandatory minimum requirements for work specified herein.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 SPRINKLER MANUFACTURERS

A. Star Sprinkler Products.

B. Grinnel Corp.

C. Viking.

D. Reliable.

2.02 GENERAL PRODUCT REQUIREMENTS

A. A main drain valve shall be installed, and auxiliary drains installed, wherever the plane of the piping changes (at low points in the line) to properly drain all parts of the system. Coordinate work with all other trades. Provide metal air gap fittings for connection to the underground drainage system. Main drain shall be 2 inch test and drain pipe connected to riser. Pipe to safe waste. Provide approved angle valve and pressure gauge with inspector's 1/4 inch test plug.

B. Drain and isolation valves shall be provided at the base of each riser. The standpipe system within the building shall be interconnected.

2.03 SPRINKLER SYSTEM

A. Sprinkler System: Provide renovations to the building's existing wet pipe sprinkler system as required to protect/cover the renovation areas to the Midland County Services Building as shown on the Plans.

B. Occupancy: Per the Architectural Plans and as required by the authority having jurisdiction.

C. Water Supply: Fire Suppression Contractor shall determine volume and pressure available from existing water flow test data (check with water utility) and/or perform their own flow/pressure testing as required to determine water supply pipe sizing required for the project.

D. Interface fire protection sprinkler system with building fire and smoke alarm system.

E. Provide fire department connections where required, coordinate with local fire authority.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

H. Note that drawings provided are schematic in nature. Contractor shall provide design and installation of all piping, offsets, fittings, valves, drains, sprinkler heads, etc. as required for a complete and operable system in accordance with NFPA and code requirements.

2.04 SPRINKLERS

A. Provide standard low velocity sprinkler heads with wide angle spray except as otherwise specified.

B. Suspended Ceiling Type: Concealed pendant type with matching push on escutcheon plate.

1. Finish: Enamel, color white (coordinate with Architect).
2. Escutcheon Plate Finish: Enamel, color white (coordinate with Architect).
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Exposed Area Type: Standard upright or pendant type with guard as required or as noted on

the drawings.

1. Finish: Enamel, color white (coordinate with Architect).
2. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate and guard.

1. Finish: Enamel, color as selected.
2. Escutcheon Plate Finish: Enamel, color white (coordinate with Architect).
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Dry (freezeproof) Sprinklers: Standard pendant type.

1. Finish: Chrome plated.
2. Escutcheon Plate Finish: Chrome plated.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

F. Temperature ratings of heads shall be ordinary temperature, 135 to 170 deg. F, unless noted otherwise.

G. Sprinkler heads in mechanical rooms, boiler rooms, electrical rooms, storage rooms, elevator machine rooms, and telecommunications rooms shall be rated for 286 deg. F.

H. Furnish sprinkler head guards in high abuse areas where damage may occur on all exposed sprinklers (e.g. storage rooms, janitor's closets, mechanical rooms, gymnasiums, typical, etc.). Guard finish/color to match sprinkler finish/color.

2.05 INSPECTOR'S TEST CONNECTION (ITC)

A. Inspector's test connection shall consist of 1 inch piping and a 1 inch globe valve and shall permit testing and flushing of lines without shut down of system or loss of fire protection capability. Inspector's test connection shall be fitted with chain attached caps.

B. Manufacturer's:

1. Seco Mfg. Inc.
2. Elkhart.

2.06 VALVE MONITOR SWITCHES

A. Valves controlling sprinkler systems shall be supervised open. Provide yoke mounted monitor switch to signal closing of fire system valves. Switch shall be UL listed and FMRC approved, single pole, double throw switch, with a roller type switch activator and a spring loaded plunger mounted in a housing.

B. Manufacturer's:

1. Grinnel.
2. Notifier.

2.07 FLOW SWITCHES

A. Sprinkler flow switches shall be provided where indicated on the drawings and required by NFPA regulations, and local authorities having jurisdiction.

B. Each water flow switch shall be equipped with an adjustable recycling type retarding device designed to prevent false alarms due to pressure surges within the piping. The flow switch shall be rated for 250 psig working pressure systems.

C. The switches shall be suitable for 120 volt or 24 volt, AC operation - coordinate with electrical / fire alarm trades.

D. Each flow switch shall be provided with a set of contacts for connection by Electrical Trades.

E. Manufacturer's:

1. Grinnel.
2. Central Sprinkler.
3. Potter-Roemer.

2.08 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim; with test and drain valve.

B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Provide approved backflow preventor or double check valve assembly at sprinkler system water source connection.

D. Place pipe runs to minimize obstruction to other work.

E. Place piping in concealed spaces above finished ceilings.

F. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

G. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

H. Flush entire piping system of foreign matter.

I. Install guards on sprinklers where damage may occur on all exposed sprinklers (e.g. storage rooms, janitor's closets, mechanical rooms, gymnasiums, etc.).

J. Hydrostatically test entire system.

K. Require test be witnessed by Fire Marshal and authority having jurisdiction.

L. Install piping per NFPA 13, the Owner's Insuring Agency, and in accordance with the requirements of local authorities having jurisdiction.

M. Individual sprinkler head branch pipes/armover shall connect to the top of the branch or main pipe.

N. Minimum run-out to sprinkler heads shall be 1 inch.

O. Locate and secure valve or hose cabinet plumb and level.

P. Drawings provided are schematic in nature. Contractor shall provide all piping, offsets, fittings, valves, drains, sprinkler heads, etc. as required for a complete and operable system in accordance with NFPA and FMRC.

Q. Where portions of systems are subject to freezing and temperatures cannot be reliably maintained at or above 40 degrees F (i.e. attic spaces, crawl spaces, loading docks, covered porches/balconies, etc.), sprinklers shall be installed as a dry pipe, pre-action system, or anti-freeze system.

3.02 INSPECTORS TEST CONNECTION (ITC)

A. Inspector's test connections shall permit testing and flushing of lines without shut-down of system or loss of fire protection capability. Fit with chain attached caps. Install ITC where indicated, and if not indicated, on remote branch lines being supplied by cross-mains so that testing may be accomplished at the "dead corners" of each sprinkler system.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 21 2200

CLEAN-AGENT FIRE PROTECTION EXTINGUISHING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Total flooding extinguishing system for enclosed spaces.

B. Fire detection system.

C. Control and supervision systems.

D. Extinguishing agent, containers, distribution and discharge system.

1.02 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.

B. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.1).

C. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers.

D. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers.

E. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.

F. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

G. ASTM A 106/A 106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

H. ASTM A 135/A 135M - Standard Specification for Electric-Resistance-Welded Steel Pipe.

I. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel.

K. FM P7825 - Approval Guide; Factory Mutual Research Corporation.

L. NEMA ICS 6 - Industrial Control and Systems: Enclosures; National Electrical Manufacturers Association.

M. NFPA 70 - National Electrical Code; National Fire Protection Association.

N. NFPA 72 - National Fire Alarm Code and Signaling Code; National Fire Protection Association.

O. NFPA 2001 - Standard on Clean Agent Fire Extinguishing Systems; National Fire Protection Association.

P. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc..

1.03 SYSTEM DESCRIPTION

A. Fire Protection System: Total flooding of hazard area with fire extinguishing agent, to extinguish fire, complying with NFPA 2001.

B. System is fixed installation with equipment designed and installed to provide fire-extinguishing capability for the building areas indicated on the Architectural & Plumbing Plans:

1. Renovate existing Clean-Agent (Novec 1230) system currently protecting the existing IT Data Center Room (Approx. 870 Sq.Ft.) as needed to protect the new Data Center IT Room 359 (Approx. 600 Sq.Ft.).

C. Locate extinguishing agent supply and backup supply in each hazard area.

D. Provide sufficient amount of fire extinguishing agent liquid to convert into fire extinguishing agent vapor. Consider the following when computing volume:

1. Volume of hazard area.
2. Specific volume of fire extinguishing agent vapor.
3. Additional quantities of fire extinguishing agent required to compensate for openings, pipe losses, and nitrogen dilution.
4. Forced ventilation, fan coast-down time, and damper actuation time.
5. Mechanical smoke control system.
6. Other special conditions affecting extinguishing efficiency.

E. Interface system with building fire alarm system, smoke control system, emergency power off system, and wet-pipe sprinkler system subcontractor trades.

1.04 SUBMITTALS

A. Product Data: To bear stamp of approval of authority having jurisdiction. Provide for each piece of equipment comprising the system including detectors, release devices, discharge nozzles, manual controls, alarm devices, annunciators, extinguishing agent containers, manifolds, and control panel.

B. Shop Drawings: To bear stamp of State of Michigan licensed Engineer and approval of authority having jurisdiction. Indicate detailed layout of system, including piping and location of each component. Include control diagrams, wiring diagrams, and written sequence of operation.

C. Design Data: Submit design calculations bearing stamp of State of Michigan licensed Engineer and approval of authority having jurisdiction. Include calculations that verify system pressures, nozzle flow rate, orifice code numbers, piping pressure losses, component flow data, and pipe sizes.

D. Test Reports: Indicate successful completion of tests.

E. Certificates: Certify that products meet or exceed specified requirements.

1. Manufacturer: Certify that system meets or exceeds specified requirements.
2. Welders: Submit certificate indicating compliance with ASME Section IX.

F. Manufacturer's Instructions: Include recommended equipment installation and system components.

G. Project Record Documents: Record actual locations of components and equipment, equipment identification markings, conduit and piping routing details, and agent container positions.

H. Operation and Maintenance Data:

1. Include electrical schematic written description of system design, drawings illustrating control logic and equipment locations, and technical brochures describing equipment.
2. Include list of recommended spare parts.
3. Include checklists and procedures for emergency situations, trouble shooting techniques, abort functions, system control panel operation, trouble procedures, and safety requirements.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Conform to NFPA 2001 for system design, fabrication, and installation.

B. Conform to NFPA 70 and NFPA 72 code for electrical wiring and wiring devices.

C. Conform to UL and FM requirements.

D. Designer Qualifications: Clean Agent Fire Protection subcontractor shall Design & Build the Clean-Agent system under direct supervision of a qualified Professional Engineer experienced in design of this Work and who is licensed in State of Michigan. Clean Agent Fire Protection subcontractor shall prepare signed/sealed Plans & Calculations for review/approval of Authority Having Jurisdition.

E. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

F. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

G. Products: Indicate manufacturer's name and pressure rating on valve body. Indicate manufacturer, type, and size, part number, orifice code or orifice diameter on discharge nozzles. Markings shall be standard and visible after installation.

H. Welding Materials and Procedures: Conform to ASME Section IX.

I. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years experience.

J. Provide certification of inspection approval of fire protection system by authority having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store equipment in shipping containers with labeling in place. Deliver fire extinguishing agent in approved containers.

PART 2 PRODUCTS

2.01 SCOPE OF WORK

A. This project involves renovation of an existing Clean Agent (Novec 1230) Fire Protection system at the Midland County Services Building (Owner = Kevin Beason, Director of Maintenance, 989-832-6792) which was designed/maintained by Healey Fire Protection Inc. (Orion, MI; 248-373-7800).

B. Refer to plans for scope of work that involves renovating the existing IT Data Center Clean Agent (Novec 1230) Fire Protection Extinguishing system.

C. The Owner will direct hire this work to their Fire Protection Subcontractor (F.P.) = Healey Fire Protection Inc.

2.02 CLEAN AGENT FIRE PROTECTION SYSTEM

A. Fire Protection System: Complete Design & Build of new, and/or renovations of existing, fire detection and suppression system that totally floods protected area with fire extinguishing agent to extinguish fire.

1. Fire Extinguishing Agent: 3M - Novec 1230 (To match existing system).
2. Locate extinguishing agent supply and backup supply in each protected area.
3. Locate manual release stations at each exit from protected area.
4. Locate abort stations at each exit from protected area.

5. Provide all manufactured system components from a single source and by a single manufacturer.
6. Provide components listed and labeled by UL for the type of system required and for use with the other components of the system.

B. Design Criteria: Provide total flooding of fire extinguishing agent at manufacturer's recommended concentration by volume, in recommended discharge time, for period of 10 minutes and with 10 percent allowance for room leakage.

1. Direct discharge parallel to ceiling; use 360 degree pattern nozzles except where obstructions would make 360 distribution inefficient.
   a. Refer to Architectural plans for sections/elevations of protected areas.
2. Provide sufficient amount of fire extinguishing agent. Consider the following when computing volume:
   a. Volume of protected area.
   b. Specific volume of fire extinguishing agent.
   c. Additional quantities of fire extinguishing agent required to compensate for openings, pipe losses.
   d. Other special conditions affecting extinguishing agent concentration.

2.03 PIPE AND PIPING SPECIALTIES

A. Steel Pipe: ASTM A 53/A 53M or ASTM A 106 Schedule 40, or ASTM A 135/A 135M Schedule 10, black.

1. Fittings: ASME B16.3 malleable iron class 300 for sizes 2 inch and smaller, or ASTM A 234/A 234M, wrought steel welding type fittings.
2. Joints: Threaded, AWS D1.1 welded, or grooved and shouldered pipe end couplings.

B. Pipe Hangers: ASME B31.1, UL approved for sprinkler systems, split clamp up to 2-1/2 inch size, riser clamps over 2-1/2 inch size, adequate to offset discharge thrust.

C. Escutcheons: Chrome plated pressed or stamped brass, one-piece or split pattern, minimum 2 inches larger than opening.

D. Gages:

1. ASME B40.100 3-1/2 inch diameter cast aluminum case, phosphor bronze bourdon tube, rotary brass movement, brass socket, front re-calibration adjustment, black figures on white background, 1 percent mid-scale accuracy, scale calibrated in psi.

2.04 EXTINGUISHING AGENT CONTAINERS

A. Containers: Steel, red enamel finish; standard model and size for ease of replacement and addition. Design, fabricate, certify, and stamp in accordance with ASME Section VIII.

1. Where multiple, replaceable containers are used, provide only containers of the same size and holding the same amount of extinguishing agent.

B. Contents: Fill with required fire extinguishing agent.

C. Contents: Fill cylinders with required fire extinguishing agent. Pressurize with dry nitrogen to 360 psi plus or minus 5 percent total pressure at 70 degrees F.

D. Identification: Permanent plate, specifying agent, tare and gross weight, pounds of fire extinguishing agent, and pressurization level; installed so plate is visible and readable.

E. Safety Release: Equip with frangible disc safety device.

F. Fire Extinguishing Agent: Per NFPA 2001.

G. Valves: Heavy duty forged brass, with safety pressure relief device, manual control, discharge valve, and pressure gage.

H. Manifold: Provide for systems with more than one container, with rack to secure each and check valves between each discharge and manifold.

2.05 MANUAL STATIONS

A. Manual Release Station: Semi-flush housing fitted with single action control "pull down" lever that locks in position after releasing spring-loaded contact switch, for mounting on electrical outlet box; addressable using manufacturer's standard monitor module.

1. Activate all audible and visual alarms.
2. Override any abort station or time delay function.
3. Activate all release and shutdown functions normally triggered by detectors or alarm system.
4. Locate engraved label adjacent to each manual release station indicating area protected and that actuation will cause discharge of fire extinguishing agent.

B. Labeling: Locate engraved label adjacent to each manual pull station, indicating area protected, and that actuation will cause discharge of fire extinguishing agent.

C. Manual System Abort Switch: Stainless steel plate with momentary contact push button, countdown timer, magnetic door holders manual release, for mounting on electrical outlet box; addressable using manufacturer's standard monitor module.

1. Locate engraved label adjacent to each manual abort station, indicating area protected and that actuation will prevent discharge of fire extinguishing agent after automatic system is activated.

2.06 DETECTORS

A. Ionization Smoke Detectors: NFPA 72, UL listed, adjustable sensitivity, operating on ionization principle, activated by combustion products, plug-in, twist-lock unit easily removed from base.

1. Ionization chambers: Dual, one for fire detection and second for reference, stabilizing detector for changes in temperature, humidity, and pressure.
2. Amplifier-Switching Circuit and Indicator Lamp: Solid state, two-wire, 24 volts. On alarm, unit shall lock and be reset at control panel.
3. Adjustment: Manual for normal or high sensitivity, with sensitivity setting visible and requiring no special tools.
4. Base Assembly: Twist-lock type with screw terminals, lamp to indicate alarm, security base lock, and relay contactor.

B. Photoelectric Smoke Detectors: NFPA 72, UL listed, adjustable sensitivity, with LED light source and photocell, activated by smoke, plug-in, twist-lock unit easily removed from base.

1. Amplifier-Switching Circuit and Indicator Lamp: Solid state, two-wire operating on detector line voltage. On alarm, unit shall lock and be reset at control panel.
2. Adjustment: Manual for normal or high sensitivity, with sensitivity setting visible and requiring no special tools.
3. Base Assembly: Twist-lock type with screw terminals, lamp to indicate alarm, security base lock, and relay contactor.

2.07 DISCHARGE NOZZLES

A. Nozzles: UL-listed; orifice size providing required rates of discharge and coverage and to distribute extinguishing agent uniformly throughout protected area.

B. Construction: Two-piece chrome plated brass or aluminum nozzle with textured finish with female pipe thread integral on body; one-piece deflector plate.

C. Construction: One piece chrome plated brass or aluminum nozzle with textured finish with female pipe thread integral on body. Direct discharge parallel to ceiling.

D. Identification: Permanently mark nozzles with manufacturer's part number, UL listing and equivalent single orifice diameter.

2.08 CONTROLS AND CONTROL PANEL

A. Controls: Combination type approved as both alarm and releasing device, with solid state internal circuitry enclosed in NEMA ICS 6, Type 1 cabinet.

B. Provide supervision to NFPA 72, Class A of following circuits for wire break or ground faults:

1. Zone detection loops.
2. Remote manual discharge stations.
3. Suppression system solenoid valves.
4. Power supply and circuit wiring and fuse.
5. Battery interconnecting wires and fuse.
6. Alarm in abort mode.

C. Conceal control switches and indicators, with exception of Power On, Master Trouble, Supervisory Trouble, Circuit 1 Alarm, Circuit 2 Alarm and Release Indicators.

D. Equip panel with following standard features:

1. Visual and audible annunciation of trouble or alarm signals.
2. Panel reset switch.
3. Trouble alarm silence switch with ring back feature.
4. Single zone detection: cross zone.
5. Battery test meter and switch.
6. Manual discharge switch.
7. Deadman abort switch.
8. Programmable timers for pre-discharge and discharge, 0 to 60 second cycle.
9. Isolated relay contactors for external alarm or equipment and ventilation shutdown.
10. Relay contactors for general trouble signal.
11. Relay contactor activated by detector zone board in alarm or trouble mode.

E. Provide nickel cadmium batteries and charger for continuous operation of detection, alarm, actuation and supervision functions for 24 hours. Provide automatic battery switch-over upon failure of primary power supply.

F. Annunciation: Provide the following annunciation:

1. Power On: Green.
2. System Trouble: Amber.
3. Battery Trouble: Amber.
4. Circuit 1 Trouble: Amber.
5. Circuit 2 Trouble: Amber.

6. Ground Fault: Amber.
7. Release trouble: Amber.
8. Alarm Circuit 1: Red.
9. Alarm Circuit 2: Red.
10. Agent Release: Red.
11. Alarm Silence: Amber.
12. Battery Polarity: Amber.
13. Abort Trouble: Amber.
14. Alarm Output Trouble: Amber.
15. Supervisory Trouble: Amber.

G. Batteries: Provide nickel cadmium batteries and charger for continuous operation of detection, alarm, actuation and supervision functions for 24 hours. Provide automatic battery switch-over upon failure of primary power supply.

2.09 MISCELLANEOUS EQUIPMENT

A. Mounting Height: Mount miscellaneous equipment listed above 80 inches above floor or 72 inches, whichever is lower.

B. Alarm Horns: 24 volts, with supervision of circuit wiring, with minimum sound level of 90 dba at 10 feet, for mounting on 4 inch electrical outlet box.

C. Strobe Beacon: Manufacturer's standard design, 24 volts, with system identification on strobe lens.

D. Motorized Fire and Smoke Dampers: Coordinate with Mechanical Contractor (M.C.) and Temperature Controls Contractor (T.C.) for coordination.

E. Space Temperature Sensor.

2.10 OPERATING SEQUENCE

A. Actuation of one detector in either zone circuit:

1. Illuminate zone indicator.
2. Energize alarm bell.
3. Shut down air-conditioning system and close dampers.
4. Close doors to area.
5. Signal building fire alarm system.

B. Actuation of second detector on second zone circuit:

1. Illuminate zone indicator.
2. Energize alarm horn.
3. Shut down power to protected equipment.
4. Actuate time delay for up to 30 seconds.
5. Release extinguishing agent into protected area.
6. If abort switch is engaged, delay release.
7. Upon abort switch disengagement release extinguishing agent unless system cleared and reset.

C. Discharge of Extinguishing Agent:

1. Sounds alarm bells and horns.
2. Operates strobes.

D. Temperature Detection:

1. Lower Temperature: Illuminate indicator and energize bell.
2. Higher Temperature: Shut down power to protected equipment.

E. High Temperature Detection: Close circuit to sprinkler pre-action valve.

F. Electrical Characteristics:

1. 120 volts, single phase, 60 Hz.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that enclosing walls are continuous above ceilings and below raised floors to enable required concentration to be built up and maintained for required time to ensure fire is extinguished.

3.02 INSTALLATION

A. Install in accordance with standards referenced in PART 2 of this section (the referenced standards) and NFPA 70.

B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe. Remove scale and dirt on inside and outside before assembly. Blow out pipe before nozzles or discharge devices are installed.

C. Route piping in orderly manner, concealed, plumb and parallel to building structure, and maintain gradient. Install piping to conserve building space, and not interfere with use of space and other work.

D. Securely support piping in accordance with ASME B31.1 with allowance for fire extinguishing agent thrust forces, and thermal expansion and contraction.

E. Install unions downstream of valves and at equipment or apparatus connections.

F. Prepare pipe, fittings, supports, and accessories for finish painting, in accordance with Section 09 9000.

G. Identify in accordance with requirements of referenced standard.

H. Identify in accordance with NFPA 2001 requirements. Refer to Section 21 0553. Place directional arrows and system labels wherever piping changes direction and minimum 20 feet on straight runs.

I. Secure cylinders as indicated on Drawings. Where manifolded, mount and support by rack as indicated. For each system provide same size cylinders containing equal amounts of liquid.

J. In rooms with suspended ceiling tiles, clip or retain tiles within 4 foot radius of the nozzles to prevent lifting during discharge.

K. Install wiring in accordance with Section 26 2717 requirements.

L. Make final connections between equipment and system wiring under direct supervision of factory trained representative of manufacturer.

M. Install engraved plastic instruction plate, detailing emergency procedures, at control panel and at each manual discharge and abort switch location. At control panel identify control logic units, contacts, and major circuits with permanent nameplates.

N. At hazard area walls pack space between pipe, pipe sleeve or surface penetration with mineral fiber with elastomer calk to depth of 1/2 inch. Provide escutcheons where exposed piping passes through walls, floors, and ceilings. Seal pipe penetrations of fire separations. Refer to Section 07 8400.

O. Locate discharge nozzle approximately 6 inches above or below ceiling and 6 inches below raised floors. Avoid interference with other piping and equipment.

P. Locate remote manual releases at one or more doors to protect area where indicated. Locate deadman abort switch adjacent.

Q. Locate strobe units at all points of entrance to protected area.

R. Locate abort station at all points of exit from protected area.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Provide interlock with automatic closing door releases. Coordinate with Door Hardware Trades.

B. Provide interlock with motorized dampers. Coordinate with Mechanical and Temperature Controls Trades.

C. Provide signal to building fire alarm system. Coordinate with Fire Alarm trades.

3.04 FIELD QUALITY CONTROL

A. Test distribution piping and valving, prior to nozzle installation, to 50 psi air pressure test. Inspect joints using soap water solution or halide torch or lamp. Repair leaks and retest. Maintain test pressure for four hours.

B. Upon completion of installation provide final checkout inspection by factory trained representative of manufacturer to ascertain proper system operation. Leave system in a fully commissioned and automatic readiness state with circuitry energized and supervised.

C. Test circuits including automatic discharge, manual discharge, equipment shut-down, alarm devices, and storage container pressure. Test supervision of each circuit.

D. Check each ionization detector with a sensitivity meter, adjust. Record sensitivity, and include record in test report.

E. Submit original copies of tests, indicating that factory trained technical representatives of the manufacturer have inspected and tested systems and are satisfied with methods of installation, connections and operation.

F. Pressure test entire enclosure with test fan, pressurizing protected area both under positive and negative conditions. Confirm that leakage is within system design allowance.

3.05 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate that components, except discharge assemblies, are functioning properly and in conjunction with controls system.

B. Submit integrated step-by-step test procedure for approval 30 days prior to start of demonstration.

1. Arrange meeting prior to demonstration with representatives of OWNER, OWNER's underwriter, and the installer.

2. Perform visual inspection and overall review of system installed.

3. Place minimum of three UL-listed recording analyzers in space. Provide certification that testing devices have been checked by recognized testing authority within two weeks of date of demonstration.

4. Certify that replacement charge can be provided within 24 hours of demonstration.

C. Discharge system using manual-release switch mounted on control panel. Run discharge test

with compressed nitrogen at 360 psi. After discharge, check for complete pressure release.

D. After satisfactory completion of discharge test, fill agent containers with amount of fire extinguishing agent specified in design calculations.

3.06 SCHEDULE

A. Hazard Area One - Zone: New Data Center IT 359 (Approx. 600 SqFt.)

1. Location of devices:

a. Smoke detector: At ceiling.

b. Heat detector: At ceiling.

c. Abort switch: Next to main entrance, left side.

d. Manual release: Next to main entrance, right side.

e. Alarm horn: Any suitable location.

END OF SECTION

SECTION 22 0001

GENERAL PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Division includes all labor, materials, equipment, tools, supervision, start-up services, Owner training, etc., including all incidental and related items, necessary to complete installation and successfully test and start up and operate the Plumbing systems indicated on the drawings, AND as described in each Section of Division 220000 Specifications.

B. All drawings and General Provisions of the Contract, including the General Conditions, Supplementary General Conditions, and Division 1 specification sections, apply to work of all Division 22 sections. The items in this section are not intended to supersede, but are supplementary to, the requirements set forth in other Divisions of the specifications.

C. The Contractor, and his Subcontractors and Suppliers, shall include in their bid all materials, labor, and equipment involved, in accordance with all local customs, codes, rules, regulations; and secure compliance of all parts of the Specifications and Drawings regardless of Sectional inclusion in these Specifications.

D. The Contractor shall be responsible for the complete and satisfactory accomplishment of all Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation, and demonstrate that all plumbing systems will operate satisfactorily under normal operating conditions.

1.02 DRAWINGS & SPECIFICATIONS

A. The drawings are diagrammatic and show the general location and arrangement of equipment, piping and related items. They shall be followed as closely as elements of the construction will permit. The Contractor shall provide/install all plumbing systems, and associated equipment, complete and include all necessary offsets, fittings, and other components required due to interferences, space constraints, code requirements, etc. as required to provide a complete/functional system.

B. The general plumbing requirements are intended to augment the drawings and specifications. Should conflicts occur between the drawings and the specifications, the strictest provision shall govern. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the ARCHITECT and/or ENGINEER for resolution prior to rough-in.

C. The Contractor shall examine the drawings of all other trades in order to verify the conditions governing the work on the job site and arrange their work accordingly, providing all piping, fittings, traps, valves and accessories as may be required to meet such conditions.

D. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the ARCHITECT and/or ENGINEER.

E. The architectural and structural drawings take precedence in all matters pertaining to the building structure; plumbing drawings in all matters pertaining to plumbing trades; Mechanical drawings in all matters pertaining to mechanical trades; and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the ARCHITECT and/or ENGINEER for resolution prior to rough-in.

1.03 COORDINATION OF WORK

A. The Contractor and his Subcontractors shall be responsible for all tasks applicable to their work

in accordance with the Specifications, Drawings, and code requirements, and shall be responsible for coordinating locations and arrangements of their work to give best results with all other relevant trades.

1. Coordinate his work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, etc. are coordinated and are installed per the Architectural reflected ceiling plan.
2. Coordinate all wall, roof, floor penetrations, equipment pads, etc. with architectural and structural trades.
3. Refer to architectural plans for exact locations/heights of fixtures (standard and barrier free), sinks, toilets, lavatories, water coolers, etc. Coordinate with architectural plans for details on casework, furniture, etc.
4. Verify requirements of all equipment with shop drawing submittals prior to installation - notify Architect/Engineer of any conflicts between shop drawings and plans prior to rough-in.
5. Coordinate locations of plumbing items that require access (i.e. isolation valves, balance valves, etc.) with reflected ceiling plan. Items located above hard non-accessible ceilings shall be provided with access doors as required.
6. Verify clearance requirements of all mechanical, electrical, plumbing equipment/systems prior to the installation of any new work. Plumbing equipment, piping, systems, etc. shall not interfere with electrical equipment spaces. Electrical conduit and equipment clearances shall not interfere with mechanical/plumbing equipment spaces.

1.04 INSPECTION OF SITE AND PROJECT DOCUMENTATION

A. The CONTRACTOR shall visit the site and examine/verify the conditions under which the work must be conducted before submitting proposal. Examine the drawings and specifications of all other trades including Mechanical, Architectural, Structural and Electrical.

B. The CONTRACTOR shall notify the ARCHITECT and/or ENGINEER, prior to submitting his bid via Request For Information (RFI), of any potential problems that he has identified during his inspection of the site or from the review of plans/specifications. RFIs must be submitted at least 5 working days prior to bid opening.

1.05 GENERAL SUPPORT REQUIREMENTS

A. Provide all necessary angle/brackets, hangers, or supplementary supporting steel as required for adequate support for all piping, ductwork, and equipment. Secure approval from Architect and/or Structural Engineer, in writing, before welding or bolting to steel framing or anchoring to concrete structure, or cutting/coring thru structural systems

B. Where piping or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

C. Install plumbing and mechanical piping systems with adequate anchors, guides, expansion loops, etc. as required to provide for piping expansion/contraction.

1.06 GUARANTEE

A. CONTRACTOR shall guarantee that all labor, materials, and equipment are free from defects and agrees to replace or repair any part of this installation which becomes defective within a period of one year from the date of substantial completion following final acceptance. Acceptance date of substantial completion shall be as determined by the ARCHITECT and/or ENGINEER.

B. The CONTRACTOR shall file with the OWNER any and all guarantees from the equipment manufacturers including the operating conditions and performance capacities they are based on.

1.07 CODES, PERMITS AND FEES

A. Refer to Division 1, General Conditions and Supplementary Conditions.

B. Unless otherwise indicated, all required permits, plan reviews, licenses, inspections, approvals and fees for mechanical work shall be secured and paid for by the CONTRACTOR.

C. All work shall be executed in accordance with the latest enforceable rules and regulations set forth in local and state codes.

1. Mechanical and Plumbing systems shall be installed per current jurisdictional codes (Michigan Mechanical Code, Michigan Plumbing Code, International Fuel Gas Code, etc.), current NFPA codes (NFPA 101, NPFA 90, etc.), and applicable sections of the Michigan Building Code.

D. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.

E. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

F. Contractor shall prepare any detailed drawings or diagrams which may be required by the governing authorities (i.e. fire protection plans, boiler room layouts, etc.) for plan review/permit approval.

1.08 UTILITIES

A. Rules of local utility companies shall be complied with. The CONTRACTOR shall check with each utility company supplying service to the installation (i.e. water, gas, sewer, storm, etc.) and coordinate service requirements including, but not limited to, all valves, meters, regulators, etc. which will be required. The CONTRACTOR shall provide an allowance for all utility costs in his bid. [OR the OWNER shall pay for any “direct” utility charges required for new/revised service]

B. In the event that the plans and specifications conflict with any utility rules, regulations, or codes applying, said utility rules, regulations and codes shall govern.

1.09 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

A. All items that the CONTRACTOR proposes to use in the work that are not specifically named in the contract documents must be submitted for review. Such items must be submitted to the ARCHITECT and/or ENGINEER for approval a minimum of five (5) days prior to bid opening. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations. The Contractor shall call out/illustrate to the Engineer any/all differences between the basis of design and the Contractor’s proposed substitution items.

1.10 MATERIAL AND EQUIPMENT MANUFACTURERS

A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of plumbing, heating, ventilating and air conditioning equipment and shall be the manufacturer's latest design.

B. If an approved manufacturer is other than the manufacturer used as the basis for design, the equipment of product provided shall be equal in quality, durability, appearance, capacity and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Substitution Items Requiring Prior Approval specified in this Section of the Specifications. All costs to make these items of equipment comply with these requirements including, but not limited to, piping, sheet

metal, electrical work, and building alterations shall be included in the original bid.

C. All package unit skid mounted equipment that are factory assembled shall meet, in detail, the products named and specified within each section of the detailed mechanical and electrical specifications.

1.11 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

A. Provide compete maintenance and operating instructional manuals covering all plumbing equipment as specified herein, Division 1 requirements, and individual equipment specification sections.

B. The O&M data shall be bound in a suitable number of 3" or 4", 3-ring, hard cover binders. Permanently imprinted on the cover shall be the words, "Manufacturer's Operation and Maintenance Data", project title, location of project, and the date. A table of contents shall be provided in the front of each binder.

C. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Each piece of equipment in the O&M manual shall be identified as identified on the project drawings (i.e. Domestic Water Heater DWH-1, Pump P-1, Grease Trap GT-1, etc.).

D. Internally subdivide the binder contents with permanent page dividers, organized by specification section and/or major equipment/systems (i.e. Plumbing Equipment, Plumbing Fixtures, Plumbing Specialties, etc.).

E. Contents: Each volume of O&M manual shall have three parts:

1. Part 1: A directory listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: O&M data, arranged and subdivided by major equipment/systems. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers:
    a. List of equipment.
    b. Copies of Shop drawings and product data, approved by Architect/Engineer.
    c. Installation and operational procedures.
    d. Routine maintenance procedures.
    e. Trouble shooting procedures.
    f. Complete parts lists by nomenclature, manufacturer's part number and use.
    g. Recommended spare parts lists.
    h. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
    i. Complete wiring and schematic diagrams.
    j. Elevations and/or sections cut through all of the major equipment and sub-assemblies.
3. Part 3: Project documents and certificates, including the following:
    a. Testing, Adjusting, and Balance Reports (approved by Engineer).
    b. Warranty Certificates.
    c. Copies of approved construction permits.

F. Maintenance and Operating manuals shall be provided, in digital .pdf format, to the ARCHITECT and/or ENGINEER for review when construction is 75% complete.

G. A minimum of two (2) hard copies, as well as digital .pdf format, of all approved Operation and

Maintenance literature shall be furnished to the OWNER within 10 days after final inspection. O&M manuals must be completed prior to start of OWNER training as the manuals shall be used as the basis of the training.

1.12 SHOP DRAWINGS/SUBMITTALS

A. Refer to General Conditions and Supplementary General Conditions.

B. All shop drawings shall be submitted in groupings of similar and/or related items. Incomplete submittal groupings will be returned unchecked.

C. Submit fire protection system shop drawings, product data and hydraulic calculations to local authorities having jurisdiction, the OWNER'S insuring agency, and the ARCHITECT and/or ENGINEER for approval prior to fabrication or installation. Submit proof of approval to ARCHITECT and/or ENGINEER.

D. Unless noted otherwise, submit digital (.pdf format) copies of complete manufacturer's shop drawings for all plumbing equipment, valves, specialties, wiring diagrams and control diagrams including, but not limited to the items listed below. Where items are referred to by symbolic designation on the drawings and specifications, all submittals shall bear the same designation. Refer to other Sections of the plumbing specifications for additional requirements.

1) 22 0721 Piping Safety Covers
2) 22 1006 Plumbing Piping Specialties
3) 22 4000 Plumbing Fixtures

1.13 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection the CONTRACTOR shall instruct OWNER's designated personnel in operation, adjustment and maintenance of plumbing equipment and systems at agreed upon times.

B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

C. Use Operation and Maintenance Manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.14 RECORD DRAWINGS

A. The CONTRACTOR shall keep accurate notes of all deviations from the construction documents and discrepancies of construction on field drawings as they occur. The marked up field documents shall be available for review by the ARCHITECT and/or ENGINEER, and OWNER at their request.

1.15 HAZARDOUS CONDITIONS

A. Prior to starting work in any hazardous condition area, obtain approval for doing so from a qualified representative of the OWNER who is designated and authorized by the OWNER to perform testing and abatement, if necessary, of all hazardous materials including, but not limited to, asbestos, PCB, etc.. The CONTRACTOR shall visit the site prior to construction and indicate to the OWNER'S representative the areas that may need testing and abatement (i.e. existing pipes that need renovating, boilers that need removal, etc.). The CONTRACTOR shall not perform any inspection, testing, containment, removal or other work that is related in any way whatsoever to hazardous materials under the contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. Install equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the ARCHITECT and/or ENGINEER for resolution.

3.02 WORK INVOLVING OTHER TRADES

A. Certain items of equipment or materials specified in the Plumbing Division may have to be installed by other trades due to code requirements or union jurisdictional requirements. In such instances, the Contractor shall complete the work through an approved, qualified subcontractor and shall include the full cost for same in his bid.

3.03 COORDINATION

A. Install work to avoid interference with work of other trades including, but not limited to, architectural and electrical trades. Remove and relocate any work that causes an interference at CONTRACTOR's expense. Disputes regarding the cause of an interference shall be resolved by the ARCHITECT and/or ENGINEER.

3.04 CHASE, SHAFTS AND RECESSES

A. Coordinate with structural, architectural and other trades to ensure accurate location and size of chases, shafts and recesses required for plumbing systems/piping.

3.05 SLEEVES

A. Provide and install Schedule 40 black steel pipe sleeves, cut to length, wherever pipes pass through above grade walls and floors. Provide and install galvanized steel pipe sleeves, cut to length, wherever pipes pass through below grade foundation walls and slab on grade floors. Sleeves shall terminate flush with walls in finished areas. All sleeves through the floor are to extend two (2) inches above finish floor.

B. Provide escutcheons at each penetration through walls, floors, and ceilings in exposed areas.

C. Patch sleeves to match building material.

3.06 SEALING OF PLUMBING OPENINGS

A. Seal the space around pipes and sleeves through walls, floors and ceilings.

B. Refer to specification 078400-Firestopping.

C. Provide adequate clearance to allow for proper pipe movement and sealing.

D. Provide/install fireproof wall and floor sleeves as required by applicable building codes at all applicable wall, ceiling, and floor penetrations. Refer to Architectural plans for wall assembly ratings.

E. Sleeves placed in floors shall be flush with the underside of the floor construction and shall have planned, square ends, extending 2 inches above the finished floor, unless otherwise noted or detailed.

F. Where sleeves pass through reinforced concrete floors, they shall be properly set in position prior to concrete pouring in such a way that they will be maintained in position until the concrete is set.

G. Pipes passing through below grade perimeter walls or slabs on grade shall have the space between the pipe and sleeve sealed watertight with a mechanically expandable elastomer seal device.

H. Penetrations through fire rated floors and walls shall be fire-stopped in accordance with applicable building code requirements with UL and FMRC approved materials and shall have a fire rating equal to or greater than the fire partition rating. Refer to architectural plans for locations and assembly ratings.

1. Packing: Refractory fiber or ceramic fiber.

a. Manufacturers:

1) Carborundum Fiberfrax.

2) Johns-Manville - Cerafelt.

3) Eagle Picher Epitherm 1200.

4) Babcock and Wilcox Kaowool.

2. Fire stop sealant.

a. Manufacturers:

1) Hilti

2) Tremco

3) Mameco

4) Pecora

3. For polypropylene (Acid Waste/Acid Vent piping) penetrations through fire rated assemblies, provide an intumescent firestop.

a. Hilti CP 642 Firestop Collar.

b. Hilti FS-ONE High Performance Intumescent Firestop Sealant.

c. 3M Fire Barrier PPD Plastic Pipe Device.

d. 3M Fire Barrier Intumescent Firestop Sealant.

4. Where combustible pipes, tubes, vents, etc. penetrate a fire rated assembly, such penetrations shall be protected by an approved through-penetration fire stop collar/sealant system per the building code.

a. Through -penetration firestop systems shall be tested in accordance with ASTM E814 with a minimum positive pressure differential of 0.01 inch WG. Through penetration firestop systems shall have a "F" rating and a "T" rating of not less than 1 hour but not less than the required rating of the assembly penetrated.

b. Hilti CP 642 Firestop Collar.

c. Hilti FS-ONE High Performance Intumescent Firestop Sealant.

d. 3M Fire Barrier PPD Plastic Pipe Device.

e. 3M Fire Barrier Intumescent Firestop Sealant.

3.07 CUTTING, CORING AND PATCHING

A. Refer to General Conditions.

B. Unless noted otherwise, the CONTRACTOR shall perform all cutting, coring, and patching that may be necessary for the installation of their Work. All cutting, coring, patching and repair work shall be performed by the CONTRACTOR through qualified Subcontractors. CONTRACTOR shall include full cost of same in his bid.

C. Secure approval form Architect and/or Structural Engineer, in writing, before cutting, welding/bolting to, or anchoring from any structural building components (i.e. structural steel, load bearing walls, footings/foundations, concrete floors/ceilings, etc.).

3.08 EQUIPMENT SUPPORTS

A. Shall be as required or as shown on plans or specified.

B. For equipment suspended form ceiling or walls, furnish and install all inserts, rods, structural steel frames, brackets and platforms required. Obtain approval of ARCHITECT and/or

ENGINEER for same including loads, locations, and methods of attachment.

3.09 EQUIPMENT CONNECTIONS

A. Make connections to equipment, fixtures and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufactures of the particular equipment furnished.

B. All piping connections to equipment shall be flanged or shall be made with unions to facilitate equipment removal.

C. All piping connections to pumps, coils, and other equipment shall be installed without strain at the pipe connection of this equipment.

D. Brass unions for connections of 2 inch and less and flanged union with dielectric gasket and bolt sleeves for 2-1/2 inch and greater shall be used for equipment connections of dissimilar metals.

3.10 ACCESSIBILITY

A. All equipment shall be installed so as to be readily accessible for operation, maintenance, and repair, as required by the equipment manufacturer and as subject to the approval of the ENGINEER.

3.11 ACCESS DOORS

A. The CONTRACTOR, and/or his Subcontractors, shall provide access doors for access to any of their respective plumbing equipment (i.e. valves, controls, equipment, etc.) that is installed in inaccessible areas. Provide access doors in the walls, as required to make all electrical boxes, controls and other equipment installed by the CONTRACTOR accessible. In the walls, provide Milcor No. "DW" or "M" as required to make all equipment installed by the CONTRACTOR accessible. Minimum size 12 inches x 12 inches. In the ceiling, provide Milcor N. 3210, 3105 or 3206 for accessibility as mentioned above, 24 inches x 24 inches minimum size. The plaster or acoustical tile insert shall be by the architectural trades. Areas with accessible ceilings (ceilings where tiles are not fastened in place and can be individually removed without removal of adjacent tiles) will not require access doors.

B. Refer to Architectural specifications for manufacturer's and model numbers and additional information.

C. The CONTRACTOR, and/or his Subcontractors, shall be responsible for quantities of access doors and shall receive approval for locations from the ARCHITECT and/or ENGINEER prior to installation.

D. The CONTRACTOR, and/or his Subcontractors, shall purchase appropriate access doors, coordinate locations, and shall pay for installation by a qualified architectural subcontractor.

E. When access doors are in fire resistant walls or ceilings, they must bear the Underwriters' Laboratories, Inc., Label, with time design rating equal to or exceeding that of the wall or ceiling unless they were a part of the tested assembly.

3.12 CLEANING

A. Each trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.

B. After equipment and systems have been completed and tested, each entire system shall be cleaned and flushed.

C. Prior to connection of new piping to existing piping systems, all new piping shall be subject to initial flushing, cleaning and final flushing. Provide temporary bypass piping and fittings, temporary valves and strainers, temporary water make-up piping with approved means of backflow prevention, and temporary pumps as needed to perform specified flushing and cleaning requirements.

3.13 PAINTING

A. All plumbing systems, equipment, piping, etc. exposed in “finished” areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect.

3.14 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Electrical equipment furnished by Plumbing Trades and installed by Electrical Trades shall be turned over to Electrical Trades in good condition.

B. Equipment and materials shall be protected from theft, injury or damage.

C. Materials with enamel or glaze surface, shall be protected from damage by covering and/or coating as recommended in bulletin, "Handling and Care of Enameled Cast Iron Plumbing Fixtures," issued by the Plumbing Fixtures Manufacturers Association, and as approved.

D. Coat polished or plated metal parts with white petroleum jelly immediately after installation.

E. Protect equipment outlets, pipe openings with temporary plugs or caps.

F. Provide adequate storage for all equipment and materials delivered to the job site. Equipment set in place in unprotected areas must be provided with temporary protection.

3.15 GENERAL SUPPORT REQUIREMENTS

A. Each trade shall provide all required supporting components to properly support their work. Supporting components/systems shall be in accordance with Code and as specified.

B. Provide all necessary angle/brackets or supplementary steel as required for adequate support for all piping, ductwork, specialties, and equipment. Secure approval form ARCHITECT and/or Structural ENGINEER, in writing, before welding or bolting to steel framing or anchoring to concrete structure.

C. Where piping, specialties, or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

3.16 PIPING INSTALLATION IN PLENUM SPACES

A. Pipe and pipe fittings installed in mechanical air plenum spaces shall of non-combustible materials. If PVC piping is specified as an approved material, it shall be wrapped with at least 1.5 inches of non-combustible insulation plus continuous vapor barrier which meet building code required smoke and flame spread ratings.

B. Coordinate location of mechanical plenum spaces with electrical trades for plenum rated cable requirements.

3.17 DRAWINGS AND MEASUREMENTS

A. These specifications and accompanying drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either the drawings or specifications shall be as binding as if call for by both. The work herein described shall be complete in every detail.

B. The Drawings are not intended to be scaled for rough-in measurements, nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor. The Contractor shall check latest architectural drawings to locate equipment/fixtures/etc., check latest structural drawings for interferences, etc.

3.19 PIPING SYSTEMS TESTING

A. Test backflow prevention at connections between potable water and nonpotable water for proper functioning under normal operating conditions. Provide Owner with one (1) copy of the potable

water backflow prevention test report.

B. Test drainage piping systems in accordance with their respective and applicable governing codes. Test drainage and waste piping hydraulically by filling the system to its highest point or at a static head of 10 feet, whichever is higher.

C. Pressure test plumbing piping (domestic cold water, domestic hot water, hot water recirculation, etc.) in accordance with governing and applicable codes. At minimum, test with water at 225 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

D. Pressure test natural gas and propane gas piping in accordance with governing and applicable codes. At minimum, test with air at 100 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

3.20 DEMOLITION WORK

A. All demolition of existing plumbing equipment and materials shall be done by the Contractor unless otherwise indicated. Included are all items such as, but not limited to, existing piping, pumps, supports and equipment where such items are not required for the proper operation of the modified system.

B. In general, demolition work is indicated on the drawings. However, the Contractor shall visit the job to determine the full extent and character of this work.

C. Unless specifically noted to the contrary, removed materials shall not be reused in the work. Salvaged materials that are to be reused shall be stored safe against damage and turned over to the appropriate trade for reuse. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived. Remove items from the systems and turn over to the Owner in their condition prior to removal. The Owner shall move and store these materials. Items on which the Owner waives ownership shall become the property of the Contractor, who shall remove and legally dispose of, away from the premises.

D. Work that has been cut or partially removed shall be protected against damage until covered by permanent construction.

E. Clean and flush the interior and exterior of all existing relocated equipment and its related piping, valves, and accessories that are to be reused of all mud, debris, pipe dope, oils, welding slag, loose mill scale, rust and other extraneous material so that the existing equipment and all accessories can be repainted and repaired as required to place in first-class working condition.

F. Where existing equipment is to be removed, cap piping under floor, behind face of wall, above ceiling or at mains.

3.21 WORK IN EXISTING BUILDINGS

A. The Owner will provide access to existing buildings as required. Access requirements to occupied buildings shall be identified on the project schedule. The Contractor, once work is started in the existing building, shall complete same without interruption so as to return work areas as soon as possible to Owner.

B. Adequately protect and preserve all existing and newly installed work. Promptly repair any damage to same at Contractor's expense.

C. Consult with the ARCHITECT and/or ENGINEER as to the methods of carrying on the work so as not to interfere with the Owner’s operation any more than absolutely necessary. Accordingly, all service lines shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the Architect and/or Owner's Representative.

3.22 EXTRA WORK

A. For any extra work which may be proposed, the Contractor shall furnish to the General Contractor/Construction Manager, an itemized breakdown of the estimated cost of all materials and labor required to complete this work. The estimate cost breakdown shall include unit prices (same prices for increase/decrease of work) for all materials (i.e. piping, valves, equipment,

equipment rental, etc.) and all labor (i.e. manhours, overtime, etc.) which may be required for any proposed extra work. The Contractor shall not proceed until receiving a written order from the General Contractor establishing the agreed price and describing the work to be done.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING SYSTEMS AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corp.

B. Champion-America, Inc.

C. Seton Identification Products.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: Conform to ANSI/ASME A13.1, unless specified otherwise.
2. Letter Height: 1/2 to 1 inch to suit the size of equipment being labeled.
3. Background Color: Conform to ANSI/ASME A13.1, unless specified otherwise.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

2.04 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify plumbing equipment (i.e. water heaters, pumps, boilers, heat transfer equipment, tanks, water treatment devices, etc.) with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify valves in main and branch piping with tags.

H. Tag automatic controls, instruments, and relays. Key to control schematic.

I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service (CW, HW, HWR, SAN, Gas, etc.), flow direction, and unique pressure or temperature if necessary to distinguish between other systems. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction. Arrows and markers shall be mounted to provide unobstructed visibility from floor level.

J. Paint exposed piping in “finished” areas per specification section 09900.

END OF SECTION

SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 REFERENCE STANDARDS

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].

C. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.

D. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

E. ASTM C 449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

F. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

G. ASTM C 533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

H. ASTM C 534/C 534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

I. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation.

J. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

K. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

L. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.

M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than 10 years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 10 years of experience.

C. Where insulation and covering is specified or required to include a vapor barrier, it is critical that the integrity of the vapor barrier is maintained. Do not use fasteners that may unintentionally penetrate the vapor barrier. Where fasteners must penetrate the vapor barrier, the vapor barrier

shall be repaired with a patch or tape of the same material.

D. Insulation types and thickness shall be at minimum required to meet current energy code standards or as listed to exceed current applicable energy code.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

B. Store insulation in original wrapping and protect from weather, dirt, chemicals, and damage.

1.06 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

1.07 INSULATION OF EXISTING SYSTEMS

A. On renovation/addition projects where existing piping systems are being modified the existing piping systems shall be reinsulated as required to maintain sealed insulation/vapor barrier.

B. After completion of any required asbestos abatement, reinsulate all existing systems.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Where insulation and covering is specified or required to include a vapor barrier, it is critical that the integrity of the vapor barrier is continuously maintained. Fasteners or other securing devices that may unintentionally penetrate, or damage, the vapor barrier are prohibited. Where fasteners must penetrate the vapor barrier, the vapor barrier shall be repaired.

C. Non-combustible (PVC, etc.) piping/fittings that are installed with-in/thru mechanical air plenum spaces shall be wrapped with required non-combustible insulation plus continuous vapor barrier which meet building code required smoke and flame spread ratings.

2.02 GLASS FIBER

A. Manufacturers:

1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.

1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.
4. Density: 3.5 lb./cu. ft.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches. Secure with self-sealing longitudinal laps and butt strips.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:

1. Compatible with insulation as recommended by insulation manufacturer.

F. Insulating Cement/Mastic:

1. ASTM C 195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz./sq. yd. weight.
2. Blanket: 1.0 lb./cu ft. density.

H. Indoor Vapor Barrier Finish:

1. Vinyl emulsion type acrylic, compatible with insulation, white color.

I. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J. Outdoor Breather Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Insulating Cement:

1. ASTM C 449/C 449M.

2.03 HYDROUS CALCIUM SILICATE

A. Manufacturers:

1. Johns Manville Corporation; Model Thermo-12/Blue: www.jm.com.
2. Ownes-Corning; Model Kaylo Pink:
3. Pablo Div., Fiberboard Corp.; Model Super Caltemp Gold: www.jm.com.

B. Insulation: ASTM C 533 and ASTM C 795; rigid molded, asbestos free, gold color.

1. 'K' value: ASTM C 177 and C518; 0.44 at 300 degrees F, when tested in accordance with ASTM C 177 or ASTM C 518.
2. Maximum service temperature: 1200 degrees F.
3. Density: 15 lb./cu ft.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Insulating Cement:

1. ASTM C 449/C 449M.

2.04 JACKETS

A. PVC Plastic.

1. Manufacturers:
   a. Johns Manville Corporation: www.jm.com.
   b. Knauf.
   c. Ceel-Co.
   d. Certain Teed.
2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   a. Minimum Service Temperature: 0 degrees F.
   b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.

d. Maximum Flame Spread: ASTM E84; 25.

e. Maximum Smoke Developed: ASTM E84; 50.

f. Thickness: 15 mil.

g. Connections: Pressure sensitive color matching vinyl tape.

h. Jacket shall be ultraviolet-resistant.

i. Jackets shall meet USDA and FDA requirements where applicable.

3. Covering Adhesive Mastic:

a. Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

C. Equipment nameplates, identification tags, etc. shall not be covered by insulation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations. Install PVC jackets and fitting covers.

1. Where exposed in finished spaces, paint to match finishes. Refer to specification section 09900 - Coordinate color with Architect.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic. Vapor barrier shall be continuous.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

3. Provide calcium silicate inserts or other heavy density insulating material suitable as approved by the Engineer for the planned temperature range, where pipes pass through walls, sleeves, pipe hangers/rollers, and other pipe penetrations.

4. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints. Bevel and seal ends of insulation. Provide removable insulation access sections to permit access and removal of unions, flanges, and strainer baskets. Access sections shall be capable of removal and replacement with no damage to adjacent insulation.

D. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Finish with tape and white paintable vapor barrier jacket.

4. Provide calcium silicate inserts or other heavy density insulating material suitable as approved by the Engineer for the planned temperature range, where pipes pass through walls, sleeves, pipe hangers/rollers, and other pipe penetrations.
5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints. Bevel and seal ends of insulation.

E. Provide removable insulation covers for providing access/removal of unions, flanges, strainer baskets, steam valves, manway covers, expansion joints, valves at pressure reducing stations, and plate/frame heat exchangers. Access sections shall be capable of removal and replacement with no damage to adjacent insulation.

F. Inserts and Shields:

1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts. All piping, all sizes, shall have shields installed between the pipe hangers and insulation or inserts.
2. Insert Application: Piping 1 inches diameter or larger.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate insulation (or other heavy density insulating material, as approved by the Engineer, for the planned temperature range).

G. Continue insulation through walls, sleeves, pipe hangers/rollers, and other pipe penetrations. Install steel sleeves at all wall and floor penetrations. Finish at supports, protrusions, and interruptions. At fire separations, fire caulk per building code requirements.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

I. Floor drains and traps above finished areas, receiving cold condensate drains, shall be insulated.

J. Ends of insulation shall be sealed off. Spray paint is not acceptable. There shall be no exposed ends.

K. Insulation not properly installed shall be removed and replaced or repaired as necessary.

L. Insulation on hot surfaces shall be applied while the surfaces are hot to avoid breaking of insulation during expansion of piping.

3.03 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot Water Supply:
   a. Glass Fiber Insulation:
      1) Pipe Size Range: 2 inch and smaller.
         a) Thickness: 1.0 inch.
      2) Pipe Size Range: 2-1/2 inch and larger.
         a) Thickness: 1.5 inch.
2. Domestic Hot Water Recirculation:
   a. Glass Fiber Insulation:
      1) Pipe Size Range: 2 inch and smaller.

a) Thickness: 1 inch.

2) Pipe Size Range: 2-1/2 inch and larger.

a) Thickness: 1.5 inch.

3. Domestic Cold Water:

a. Glass Fiber Insulation:

1) Pipe Size Range: All sizes.

a) Thickness: 1.0 inch.

END OF SECTION

SECTION 22 0721

PIPING SAFETY COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping Safety Covers.

B. Lavatory Piping Enclosure.

1.02 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council.

B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

D. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness.

1.03 SUBMITTALS

A. Product Data: Manufacturer's descriptive literature for products specified in this section.

B. Shop Drawings: Indicate locations and configurations of piping insulation for indicated plumbing configurations.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products of this section in manufacturer's unopened packaging until installation; maintain storage conditions for products in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Truebro, Inc. www.truebro.com.

B. McGuire Manufacturing.

2.02 PIPING INSULATION ACCESSORIES

A. Provide products that comply with the following:

1. Americans With Disabilities Act (ADA), Article 4.19.4.
2. ANSI/ICC A117.1, American National Standard for Accessible Buildings and Facilities.
3. BOCA Basic Building Code.
4. Requirements of applicable building code.

B. Piping Safety Covers: Truebro Lav-Guard.

1. Characteristics: Three-piece molded assembly, minimum 1/8 inch wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.
2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non-yellowing; having the following performance characteristics:

a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of

Burning (AEB), when tested in accordance with ASTM D 635.

b. Thermal Conductivity: K-value 1.17, when tested in accordance with ASTM C 177.

c. Indentation Hardness: 60, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.

3. Trap Assembly Cover: Three-piece assembly, with removable clean-out nut enclosure.

4. Angle Stop Covers: Formed with hinged cap for access to valve without requiring cover removal.

5. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.

6. Color: China White, gloss finish; paintable.

7. Fasteners: Manufacturer's standard re-usable snap-clip fasteners; wire-tie fasteners not permitted.

C. Lavatory Piping Enclosure: Truebro Lav-Shield.

1. Characteristics: One-piece rigid molded vinyl enclosure, minimum 1/8 inch wall thickness, factory-punched for manufacturer's wall fasteners.

2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell vinyl, having the following performance characteristics:

a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.

b. Indentation Hardness: 69, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.

3. Vinyl Color: China White, fine-textured finish; paintable.

4. Fasteners: Manufacturer's standard stainless steel wall fasteners with tamper-resistant heads.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping configurations are correct type for piping cover component configurations specified.

3.02 INSTALLATION

A. Install products of this section in accordance with manufacturer's printed installation instructions.

B. Install "Lav-Shields" below wall mounted lavatories/sinks to completely conceal exposed piping/traps/mixing valves/etc.

C. Install "Lav-Guards" below counter mounted lavatories/sinks to cover exposed piping/traps.

3.03 PROTECTION OF INSTALLED PRODUCTS

A. Do not allow damage to installed products by subsequent construction activities; protect products until Substantial Completion.

END OF SECTION

SECTION 22 1005

PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.

1. Sanitary sewer.
2. Domestic water.

1.02 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.

D. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers.

E. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.1).

F. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.9).

G. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers.

H. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

I. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings.

J. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

K. ASTM B 32 - Standard Specification for Solder Metal.

L. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.

M. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

N. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

O. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

P. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

Q. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

R. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

S. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

T. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.

U. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association (ANSI/AWWA C111/A21.11).

V. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association (ANSI/AWWA C151/A21.51).

W. AWWA C651 - Disinfecting Water Mains; American Water Works Association (ANSI/AWWA C651).

X. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute.

Y. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute.

Z. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.

AA. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.

BB. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.

CC. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

DD. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

EE. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

FF. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

GG. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

HH. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

II. ASTM A 536 - Standard Specification for Ductile Iron Castings.

1.03 SUBMITTALS

A. Project Record Documents: Record actual locations of valves.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State of Michigan, standards.

B. Valves: Bear UL and FMRC label or marking. Manufacturer's name and pressure rating marked on valve body.

C. Solder containing lead may not be used for any systems.

D. Test drainage piping systems in accordance with their respective and applicable governing codes. Test drainage and waste piping hydraulically by filling the system to its highest point or at a static head of 10 feet, whichever is higher.

E. Pressure test plumbing piping (domestic cold water, domestic hot water, hot water recirculation, etc.) in accordance with governing and applicable codes. At minimum, test with water at 225 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

1.05 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State and local plumbing and mechanical codes.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 PLUMBING SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
3. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated, and as follows:

1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap; pipe to nearest floor drain.
2. Isolate equipment using ball valves.
3. For throttling, bypass, or manual flow control services, use globe or characterized ball valves.
4. For shut-off and to isolate parts of systems or vertical risers, use ball valves.

E. Welding/Brazing/Soldering Materials and Procedures: Conform to ASME (BPV IX)

2.02 SANITARY WASTE AND VENT PIPING (SAN, V), ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D 2665.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

3. Note: Only use PVC piping where allowed by Building Codes - do not use PVC piping exposed in occupied spaces, or in return air plenums (unless insulated per code).
4. Note: PVC piping is not approved for use where exposed to damage (i.e. surface mounted in a storage room, mechanical room, gymnasium, etc.).

2.03 DOMESTIC HOT WATER (HW), DOMESTIC COLD WATER (CW), AND DOMESTIC HOT WATER RETURN (HWR) PIPING, ABOVE GRADE

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), Drawn (H).
   1. Fittings:
      a. ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze; No Lead.
   2. Joints:
      a. ASTM B 32, solder, Grade 95TA. Solder containing lead will not be permitted.

B. Minimum System Pressure Rating: 125 psig.

C. Isolation Valves: Ball valves for sizes 2-1/2 inch and smaller; Butterfly valves for sizes 2-1/2 inch and larger.

D. Exposed piping for sinks, toilets, urinals, etc. shall be chrome plated. Refer to fixture specifications for details.

2.04 STORM WATER PIPING (ST, RC), ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D 2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D 2564 solvent cement.
   3. Note: Only use PVC piping where allowed by Building Codes - do not use PVC piping in return air plenums.
   4. Note: PVC piping is not approved for use where exposed to damage (i.e. surface mounted in a storage room, mechanical room, gymnasium, etc.).

2.05 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 2-1/2 inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 2-1/2 inches:
   1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union or waterway fitting with galvanized or plated steel threaded end, grooved end, copper solder end, water impervious isolation barrier. Victaulic Style 47 (or approved equal).

2.06 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to MSS SP-58.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water:

1. Conform to MSS SP-58.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.

2.07 BALL VALVES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com.
   2. Nibco, Inc.: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Construction, 2 Inches and Smaller: 300 psi CWP, forged brass two piece body, chrome plated brass ball and stem, regular port, TFE seats and seals, blow-out proof stem, lever handle.

C. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

2.08 FLOW CONTROLS

A. Manufacturers:
   1. ITT Bell & Gossett: www.bellgossett.com.
   2. Griswold Controls: www.griswoldcontrols.com.
   3. Taco, Inc.: www.taco-hvac.com.
   4. Victaulic Company (for all grooved end valves): www.victaulic.com

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

2.09 PIPING TRANSITIONS

A. Manufacturers:
   1. Can-Tex Industries Div. of Harsco Corp.; Model CT-Adapters:
   2. Fernco Joint Sealer Co.; Model PVC Donut
   3. Joint, Inc.; Model Caulder.

B. Provide transitions for jointing two different types of pipe materials such as cast iron, clay, steel, plastic, or copper. Fabricate transitions with bushings capable of resisting normal moisture corrosion.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with grooved couplings, flanges or unions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to

walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0719.

H. Provide access where valves and fittings are not exposed.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting in “finished” areas. Refer to Section 09 9000.

K. Install bell and spigot pipe with bell end upstream.

L. Install valves with stems upright or horizontal, not inverted.

M. Install water piping to ASME B31.9.

N. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.

O. Sleeve pipes passing through partitions, walls and floors.

P. Each fixture shall have isolation valves provided. All run-outs from piping mains to fixtures shall have isolation valves installed near the main take-off, whether shown on the plans or not. All isolation valves shall be located in accessible locations.

Q. All fixtures shall be vented in accordance with a venting method approved by the ruling Plumbing Code.

R. Inserts:

1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
2. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
4. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

S. Pipe Hangers and Supports:

1. Install in accordance with MSS SP-89.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 9000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Support cast iron drainage piping at every joint.

T. Provide vents, with manual vent valves, at all high points in the system. Purge all air from the system during start-up.

3.03 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install globe or characterized ball valves for throttling, bypass, or manual flow control services.

3.04 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope, for pipes 3 inches - 6 inches in diameter. Pipes smaller than 3 inches in diameter shall drain at minimum 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.06 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

a. Pipe size: 1/2 inches to 1-1/4 inches:

1) Maximum hanger spacing: 6.5 ft.

2) Hanger rod diameter: 3/8 inches.

b. Pipe size: 1-1/2 inches to 2 inches:

1) Maximum hanger spacing: 10 ft.

2) Hanger rod diameter: 3/8 inch.

c. Pipe size: 2-1/2 inches to 3 inches:

1) Maximum hanger spacing: 10 ft.

2) Hanger rod diameter: 1/2 inch.

d. Pipe size: 4 inches to 6 inches:

1) Maximum hanger spacing: 10 ft.

2) Hanger rod diameter: 5/8 inch.

2. Plastic Piping:

a. All Sizes:

1) Maximum hanger spacing: 6 ft.

2) Hanger rod diameter: 3/8 inch.

END OF SECTION

SECTION 22 1006

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor drains.

B. Trap Primers/Protectors.

C. Cleanouts.

D. Backflow preventers.

E. Water hammer arrestors.

F. Thermostatic mixing valves.

G. Refrigerator Valve Box.

1.02 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers.

B. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering (ANSI/ASSE 1012).

C. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute.

1.03 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1. Provide pressure loss figures for backflow preventers and double check valves.

C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

D. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than 10 years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 DRAINS

A. Manufacturers:

1. Josam Company: www.josam.com.

2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.

3. Zurn Industries, Inc.: www.zurn.com.

4. Wade.

B. Floor Drain (FD-1):

1. ASME A112.21.1M; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, trap primer connection, and adjustable round nickel-bronze strainer.

2. Lacquered finish is standard. Use clamping collar on floors above grade. This is a standard floor drain used in toilet rooms, janitor's closets, showers, etc.

3. Zurn model # Z-415 (with type B-strainer), JR Smith model # 2005, or equal.

2.02 TRAP PRIMERS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.

2. Zurn Industries, Inc.: www.zurn.com.

3. Precision Plumbing Products, Inc. (PPP Inc.).

B. For single trap primer installations:

1. Install JR smith "PRIME-ESE" P-trap trap primer on the sanitary outlet of lavatories or drinking fountains.

2. Install PPP Inc. model P1 or P2 trap primer valve on domestic cold water supply pipe (maximum 1-1/2") feeding nearby sink, lavatory, water cooler, etc.

C. For multiple trap primer installations:

1. Install PPP Inc. model P1 or P2 trap primer valve and PPP Inc. trap primer distribution unit with up to 4 outlets to up to 8 floor drains.

D. Trap protectors, with auto-seal closure, may be used where allowed by code.

2.03 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.

2. Josam Company: www.josam.com.

3. Zurn Industries, Inc.: www.zurn.com.

4. Wade.

B. Cleanouts at Interior Finished Floor Areas (CO-3):

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

C. Cleanouts at Interior Finished Wall Areas (CO-4):

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

D. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 BACKFLOW PREVENTERS

A. Manufacturers:

1. Conbraco Industries: www.conbraco.com.

2. Valve Solutions, Inc.

3. Watts Regulator Company: www.wattsregulator.com.
4. Zurn Industries, Inc.: www.zurn.com.

B. Reduced Pressure Backflow Preventers:

1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.
2. Options/Accessories:
   a. Epoxy coated wye type strainer (flanged ends).
   b. OS&Y tamper switch.
   c. Air Gap.
   d. Repair kit.
3. Product: Zurn-Wilkens model 375A or equal.

2.05 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Watts Regulator Company: www.wattsregulator.com.
3. Zurn Industries, Inc.: www.zurn.com.

B. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 150 psi working pressure.

2.06 MIXING VALVES

A. Thermostatic Mixing Valves; Point of Use:

1. Manufacturers:
   a. ESBE: www.esbe.se.
   b. Leonard Valve Company: www.leonardvalve.com
   c. Lawler.
   d. Zurn-Wilkins.
   e. Watts.
2. Valve: Bronze body, stainless steel disc and spring, integral temperature adjustment cap with locking feature. Copper thermostat assembly. Buna-N; EPDM O'rings. Integral filter washers and check valves on hot and cold water inlets. ASSE 1070 listed.

2.07 REFRIGERATOR VALVE AND RECESSED BOX

A. Box Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Oatey: www.oatey.com.
3. Zurn Industries, Inc.: www.zurn.com.

B. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in

finishing cover.

1. Provide fire rated back box, meeting wall rating, where located within fire rated walls. Refer to Architectural plans for wall ratings and locations.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cleanouts:

1. Cleanouts shall be installed in accessible locations and provided in any horizontal drainage line which changes direction more than 45 degrees, at the ends of main and branch runs, base of stacks, and at all traps

2. Cleanouts in horizontal drainage lines located inside the building shall be provided at maximum spacing of 50 feet for drains 4 inches and smaller. All horizontal drainage lines inside the building larger than 4 inches shall have cleanouts spaced at a maximum of 100 feet.

3. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

4. Install floor cleanouts at elevation to accommodate finished floor.

5. Provide code required clearances for all cleanouts.

C. Floor drains:

1. Coordinate installation of floor drains with the work of placing concrete to assure proper drain elevation and floor slope.

2. Cast floor drains into the concrete at the time the floors are placed and make watertight.

3. Floor drains in above ground slabs shall be flashed with separate finish with square lead sheet pans. Floor drains in slabs on grade provided with membrane or metal pan waterproofing do not require lead flashing, but shall have two additional layers of the waterproofing at the floor drains. Flashing shall not obstruct the weepholes.

4. Floor drain trap size shall match the outlet size of the drain and the size shown on the plans. Minimum floor drain outlet/piping size shall be 3".

5. Floor drain traps subject to loss by evaporation (i.e. storage rooms, mechanical rooms, bathrooms, etc.) shall have a deep seal trap consisting of at least a 4 inch seal, a trap primer connection, and be protected by a trap primer valve or trap protector.

a. Trap Primers/Protectors:

1) Trap primer shall be provided for all floor drains subject to loss of seal by evaporation (i.e. storage rooms, bathrooms, mechanical rooms, etc.).

2) Tap off top of domestic cold water main pipe feeding nearby plumbing fixture.

3) Trap primer valves shall be installed in concealed but accessible locations for maintenance.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs, soda dispensers, etc..

E. Pipe relief from backflow preventer to nearest drain.

F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water

supply piping to lavatories, sinks, water closets, urinals, dishwashers, and other applicable fixture locations with quick closing valves.

G. Install ASSE 1070 listed "point of use" thermostatic mixing valves at all accessible fixtures (lavatories, sinks, etc.). Provide Lav-Shields under lavatories to conceal mixing valves.

H. Test backflow prevention at connections between potable water and nonpotable water for proper functioning under normal operating conditions. Provide Owner with one (1) copy of the potable water backflow prevention test report.

END OF SECTION

SECTION 22 4000

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water Closets.

B. Urinals.

C. Lavatories.

D. Sinks.

1.02 REFERENCE STANDARDS

A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment.

B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers.

C. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers.

D. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers.

1.03 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Maintenance Data: Include installation instructions, operation, maintenance data, spare and replacement parts lists, exploded assembly views, and fixture trim exploded view.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 FIELD MEASUREMENTS

A. Confirm that millwork/casework is constructed with adequate provision for the installation of countertop lavatories and sinks.

PART 2 PRODUCTS

2.01 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, elongated rim, floor or wall mounted (see

plans & fixture schedule), siphon jet flush action, china bolt caps.

1. Flush Volume: 1.6 gallon, maximum.
2. Flush Valve: Exposed (top spud).
3. Manufacturers:
   a. American Standard Inc.: www.americanstandard.com.
   b. Kohler Company: www.kohler.com.
   c. Zurn.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
2. Provide automatic/sensor operated flush valves where noted/scheduled.
   a. Battery Power.
3. Flush Valve Manufacturers:
   a. Sloan Valve Company.
   b. Zurn Industries Inc.
   c. Geberit.

C. Seats:
1. Manufacturers:
   a. Bemis Manufacturing Company: www.bemismfg.com.
   b. Church Seat Company: www.churchseats.com.
   c. Olsonite: www.olsonite.com.
   d. Centoco.
2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

D. Water Closet Carriers:
1. Manufacturers:
   a. JOSAM Company: www.josam.com.
   b. Sloan Valve Company.
   c. Zurn Industries, Inc.: www.zurn.com.
   d. JR Smith.
2. ASME A112.6.1M; adjustable cast iron frame, high extension (barrier free), integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.
   a. Provide Heavy-Duty (750 Lb) Rated Closet Carriers.

2.02 WALL HUNG URINALS

A. Wall Hung Urinal Manufacturers:
1. American Standard Inc.: www.americanstandard.com.
2. Zurn.

3. Kohler Company: www.kohler.com.

B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.

1. Flush Volume: 1.0 gallon, maximum. Washout or siphon-jet as scheduled.
2. Flush Valve: Exposed (top spud).
3. Trap: Integral.

C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.

1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
2. Provide automatic/sensor operated flush valves where noted/scheduled.
   a. Battery Power.
   b. Hard-wired.
3. Manufacturers:
   a. Sloan Valve Company; Model Royal: www.sloanvalve.com.
   b. Zurn Industries, Inc.; Model AquaVantage: www.zurn.com.
   c. Geberit; Model Vortex Max.

D. Carriers:

1. Manufacturers:
   a. JOSAM Company: www.josam.com.
   b. Sloan Valve Company.
   c. Zurn Industries, Inc.: www.zurn.com.
   d. JR Smith.
2. ASME A112.6.1M; high extension, cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.03 LAVATORIES

A. Lavatory Manufacturers:

1. American Standard Inc.: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Zurn.

B. Refer to plumbing fixture schedule.

C. Supply Faucet Manufacturers:

1. American Standard Inc.: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Chicago Faucet.
4. Delta.
5. Zurn.
6. Sloan.

D. Accessories:

1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.

2. Offset waste with perforated open strainer.
3. Screwdriver stops.
4. Flex S.S. supplies.
5. Wall Mounted Lavatory Carrier:
   a. Manufacturers:
      1) Sloan Valve Company.
      2) Zurn Industries, Inc.: www.zurn.com.
      3) JR Smith.
   b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.04 SINKS

A. Sink Manufacturers:
   1. American Standard Inc.: www.americanstandard.com.
   2. Kohler Company: www.kohler.com.
   3. Just.
   4. Elkay.

B. Refer to plumbing fixture schedule.

C. Supply Faucet Manufacturers:
   1. American Standard Inc.: www.americanstandard.com.
   2. Kohler Company: www.kohlerco.com.
   3. Elkay.
   4. Chicago Faucet.
   5. Delta.
   6. Zurn.

D. Accessories: Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, stops, flexible S.S. supplies.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Provide chrome plated rigid supplies to fixtures with screwdriver stops, reducers, and

escutcheons.

D. Install components level and plumb.

E. Install and secure fixtures in place with wall carriers and bolts.

F. Seal fixtures to wall and floor surfaces with sealant, color to match fixture.

G. Furnish and install all plumbing fixtures complete with all supply, soil, waste and vent piping connections; together with all fittings, supports, fastening devices, cocks, valves and appurtenances required to complete installations.

H. All faucets and exposed traps, fittings, trim, connections, etc. shall be of polished chromium plated brass unless otherwise specified.

I. Chrome plated pipe, valves and fittings shall be installed with strap wrenches and padded tools to avoid damage to chrome plated surfaces.

J. Install "Lav-Shields" below wall mounted lavatories/sinks to completely conceal exposed piping/traps/mixing valves/etc.

K. Install "Lav-Guards" below counter mounted lavatories/sinks to cover exposed piping/traps.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Coordinate fixture heights and installation with architectural plans, details, sections, and elevations.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 SCHEDULES

A. Fixture Heights: Install fixtures to heights above finished floor as indicated below or on Architectural plans/elevations.

1. Lavatory:

a. Standard: 31 inches to top of basin rim.

b. Accessible: 34 inches to top of basin rim.

B. Coordinate fixture heights and installation with architectural plans, details, sections, and elevations.

C. Fixture Rough-In

1. Water Closet (Flush Valve Type):

a. Cold Water: 1-1/2 Inch.

b. Waste: 3-4 Inch.

c. Vent: 2 Inch.

2. Urinal (Flush Valve Type):

a. Cold Water: 3/4 Inch.

b. Waste: 2 Inch.

c. Vent: 1-1/2 Inch.

3. Lavatory:
   a. Hot Water: 1/2 Inch.
   b. Cold Water: 1/2 Inch.
   c. Waste: 1-1/2 – 2 Inch.
   d. Vent: 1-1/2 Inch.
4. Sink:
   a. Hot Water: 1/2 Inch.
   b. Cold Water: 1/2 Inch.
   c. Waste: 1-1/2 - 2 Inch.
   d. Vent: 1-1/2 Inch.
5. Service Sink:
   a. Hot Water: 1/2 Inch.
   b. Cold Water: 1/2 Inch.
   c. Waste: 3 Inch.
   d. Vent: 1-1/2 Inch.
6. Electric Water Cooler:
   a. Cold Water: 1/2 Inch.
   b. Waste: 1-1/4 Inch.
   c. Vent: 1-1/4 Inch.

END OF SECTION

SECTION 23 0001
GENERAL MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Division includes all labor, materials, equipment, tools, supervision, start-up services, Owner training, etc., including all incidental and related items, necessary to complete installation and successfully test and start up and operate the mechanical systems indicated on the drawings, AND as described in each Section of Division 230000 Specifications.

B. All drawings and General Provisions of the Contract, including the General Conditions, Supplementary General Conditions, and Division 1 specification sections, apply to work of all Division 230000 sections. The items in this section are not intended to supersede, but are supplementary to, the requirements set forth in other Divisions of the specifications.

C. The Contractor, and his Subcontractors and Suppliers, shall include in their bid all materials, labor, and equipment involved, in accordance with all local customs, codes, rules, regulations; and secure compliance of all parts of the Specifications and Drawings regardless of Sectional inclusion in these Specifications.

D. The Contractor shall be held responsible for the complete and satisfactory accomplishment of all Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation, and demonstrate that all mechanical systems will operate satisfactorily under normal operating conditions.

1.02 DRAWINGS & SPECIFICATIONS

A. The drawings are diagrammatic and show the general location and arrangement of equipment, piping, ductwork and related items. They shall be followed as closely as elements of the construction will permit. The Contractor shall provide/install all mechanical systems, and associated equipment, complete and include all necessary offsets, fittings, and other components required due to interferences, space constraints, code requirements, etc. as required to provide a complete/functional system.

B. The general mechanical requirements are intended to augment the drawings and specifications. Should conflicts occur between the drawings and the specifications, the strictest provision shall govern. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect and/or Engineer for resolution prior to rough-in.

C. The Contractor shall examine the drawings of all other trades in order to verify the conditions governing the work on the job site. Arrange work accordingly, providing all ductwork, piping, fittings, traps, valves and accessories as may be required to meet such conditions.

D. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect and/or Engineer prior to rough-in.

E. The architectural and structural drawings take precedence in all matters pertaining to the building structure; plumbing drawings in all matters pertaining to plumbing trades; Mechanical drawings in all matters pertaining to mechanical trades; and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the ARCHITECT and/or ENGINEER for resolution prior to rough-in.

1.03 COORDINATION OF WORK

A. The Contractor shall verify clearance requirements of all electrical and mechanical equipment/systems prior to the installation of any new work. Mechanical equipment, piping, ductwork, systems, etc. shall not interfere with mechanical equipment spaces or electrical

clearances. The Contractor shall coordinate his work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, etc. are coordinated and are installed per the Architectural reflected ceiling plan.

B. The Contractor and his Subcontractors shall be responsible for all tasks applicable to their work in accordance with the Specifications, Drawings, and code requirements, and shall be responsible for coordinating locations and arrangements of their work to give best results with all other relevant trades.

1. Coordinate his work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, fire alarm, etc. are coordinated and are installed per the Architectural reflected ceiling plan.
2. Coordinate all wall, roof, floor penetrations, equipment locations, system routings, etc. with architectural and structural trades.
3. Verify requirements of all equipment with shop drawing submittals prior to installation - notify Architect/Engineer of any conflicts between shop drawings and plans prior to rough-in.
4. Coordinate rough-in locations of mechanical control devices (i.e. thermostats, sensors, etc.) with electrical trades. T-stats/sensors shall be located @ 48" AFF unless noted otherwise.
5. Coordinate locations of mechanical items that require access (i.e. isolation valves, balance valves, balance dampers, fire dampers, damper actuators, valve actuators, filters, etc.) with reflected ceiling plan. Items located above hard non-accessible ceilings shall be provided with access doors as required.
6. Verify clearance requirements of all mechanical, electrical, plumbing equipment/systems prior to the installation of any new work. Mechanical equipment, piping, ductwork, systems, etc. shall not interfere with electrical equipment spaces. Electrical conduit and equipment clearances shall not interfere with mechanical/plumbing equipment spaces.

1.04 INSPECTION OF SITE AND PROJECT DOCUMENTATION

A. The Contractor shall visit the site and examine/verify the conditions under which the work must be conducted before submitting proposal. The Contractor shall examine the drawings and specifications of all other trades including Mechanical, Architectural, Structural and Electrical.

B. The Contractor shall notify the Architect and/or Engineer, prior to submitting his bid via Request For Information (RFI), of any potential problems that he has identified during his inspection of the site or from the review of plans/specifications. RFIs must be submitted at least 5 working days prior to bid opening.

1.05 GENERAL SUPPORT REQUIREMENTS

A. Provide all necessary angle/brackets, hangers, or supplementary supporting steel as required for adequate support for all piping, ductwork, and equipment. Secure approval form Architect and/or Structural Engineer, in writing, before welding or bolting to steel framing or anchoring to concrete structure, or cutting/coring thru structural systems.

B. Where piping, ductwork, or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

C. Install mechanical piping systems with adequate anchors, guides, expansion loops, etc. as required to provide for piping expansion/contraction.

1.06 GUARANTEE

A. Contractor shall guarantee that all labor, materials, and equipment are free from defects and agrees to replace or repair any part of this installation which becomes defective within a period of one year from the date of substantial completion following final acceptance. Acceptance date of substantial completion shall be as determined by the Architect and/or Engineer.

B. The Contractor shall file with the Owner any and all guarantees from the equipment manufacturers including the operating conditions and performance capacities they are based on.

1.07 CODES, PERMITS AND FEES

A. Refer to Division 1, General Conditions and Supplementary Conditions.

B. Unless otherwise indicated, all required permits, plan reviews, licenses, inspections, approvals and fees for mechanical work shall be secured and paid for by the Contractor.

C. All work shall be executed in accordance with the most current rules and regulations set forth in local and state codes.

1. Mechanical and Plumbing systems shall be installed per current jurisdictional codes (Michigan Mechanical Code, Michigan Plumbing Code, International Fuel Gas Code, Michigan Building Code, etc.), current NFPA codes (NFPA 101, NPFA 90, etc.), and applicable sections of the Michigan Building Code.

D. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.

E. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

1.08 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

A. All items that the Contractor proposed to use in the work that are not specifically named in the contract documents must be submitted for review. Such items must be submitted in .pdf format to the Architect and/or Engineer for approval a minimum of seven (7) days prior to bid opening. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations. The Contractor shall call out/illustrate to the Engineer any/all differences between the basis of design and the Contractor’s proposed substitution items.

1.09 MATERIAL AND EQUIPMENT MANUFACTURERS

A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of plumbing, heating, ventilating and air conditioning equipment and shall be the manufacturer's latest design.

B. If an approved manufacturer is other than the manufacturer used as the basis for design, the equipment of product provided shall be equal in quality, durability, appearance, capacity and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Substitution Items Requiring Prior Approval specified in this Section of the Specifications. All costs to make these items of equipment comply with these requirements including, but not limited to, piping, sheet metal, electrical work, and building alterations shall be included in the original bid.

C. All package unit skid mounted equipment that are factory assembled shall meet, in detail, the products named and specified within each section of the detailed mechanical and electrical Specifications.

1.10 SHOP DRAWINGS/SUBMITTALS

A. Refer to General Conditions and Supplementary General Conditions.

B. All shop drawings shall be submitted in groupings of similar and/or related items. Incomplete submittal groupings will be returned unchecked.

C. Unless noted otherwise, submit digital (.pdf format) copies of complete manufacturer's shop drawings for all equipment, valves, plumbing and heating specialties, refrigeration specialties, pipe hangers, wiring diagrams and control diagrams including, but not limited to the items listed below. Where items are referred to by symbolic designation on the drawings and specifications, all submittals shall bear the same designation. Refer to other Sections of the mechanical specifications for additional requirements.

1) 23 0593 Testing, Adjusting, and Balancing For HVAC

2) 23 3300 Air Duct Accessories

3) 23 3700 Air Outlets and Inlets

4) 238126 Computer Room Air Conditioners

1.11 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

A. Refer to Division 1, General Requirements.

B. Provide compete maintenance and operating instructional manuals covering all mechanical equipment as specified herein, Division 1 requirements, and individual equipment specification sections.

C. The O&M data shall be bound in a suitable number of 3" or 4", 3-ring, hard cover binders. Permanently imprinted on the cover shall be the words, "Manufacturer's Operation and Maintenance Data", project title, location of project, and the date. A table of contents shall be provided in the front of each binder.

D. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Each piece of equipment in the O&M manual shall be identified as identified on the project drawings (i.e. Air Handling Unit AHU-1, Supply Diffuser S-1, etc.).

E. Internally subdivide the binder contents with permanent page dividers, organized by specification section and/or major equipment/systems (i.e. 230593_TESTING, ADJUSTING, AND BALANCING FOR HVAC, 233300_AIR DUCT ACCESSORIES, etc.)

F. Contents: Each volume of O&M manual shall have three parts:

1. Part 1: A directory listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: O&M data, arranged and subdivided by major equipment/systems. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers:

   a. List of equipment.

   b. Copies of Shop drawings and product data, approved by Architect/Engineer.

   c. Installation and operational procedures.

   d. Routine maintenance procedures.

   e. Trouble shooting procedures.

   f. Complete parts lists by nomenclature, manufacturer's part number and use.

   g. Recommended spare parts lists.

   h. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.

   i. Complete wiring and schematic diagrams.

j. Elevations and/or sections cut through all of the major equipment and sub-assemblies.

k. At the end of each section, a maintenance schedule shall be provided for each piece of equipment. The schedule shall display the daily, weekly, monthly, semi-annual, and annual lubrication and preventative maintenance required in order to meet warranty conditions and the manufacturer's recommendations for optimal performance and life of the equipment. Photos or reproduction of the manufacturer's literature will not be accepted.

3. Part 3: Project documents and certificates, including the following:

a. Testing, Adjusting, and Balance Reports (approved by Engineer).

b. Warranty Certificates.

c. Copies of approved construction permits.

G. Maintenance and Operating manuals shall be provided, in digital .pdf format, to the Architect and/or Engineer for review when construction is 75% complete.

H. A minimum of two (2) hard copies, as well as digital .pdf format, of all approved Operation and Maintenance literature shall be furnished to the Owner within 10 days after final inspection. O&M manuals must be completed prior to start of Owner training as the manuals shall be used as the basis of the training.

1.12 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection the Contractor shall instruct Owner's designated personnel in operation, adjustment and maintenance of mechanical equipment and systems at agreed upon times.

B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

C. Use Operation and Maintenance Manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

E. Training shall be provided by factory authorized/trained representatives familiar with the startup and training on the equipment.

1.13 RECORD DRAWINGS

A. Contractor shall submit to the Architect and/or Engineer, record drawings which have been neatly marked to represent as-built conditions for all new mechanical work.

B. The Contractor shall keep accurate note of all deviations from the construction documents and discrepancies in the concealed conditions and other items of construction on field drawings as they occur. The marked up field documents shall be available for review by the Architect and/or Engineer, and Owner at their request.

PART 2 PRODUCTS

2.01 MATERIALS

A. All material and equipment furnished and installed by the Contractor for the permanent Work shall be new, unused, of the best quality of make specified, shall be free from defects of any character, and shall be listed as approved by the UL and/or FM.

PART 3 EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. Install equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report

such conflicts to the Architect and/or Engineer for resolution.

3.02 WORK INVOLVING OTHER TRADES

A. Certain items of equipment or materials specified in the Mechanical Division may have to be installed by other trades due to code requirements or union jurisdictional requirements. In such instances, the Contractor shall complete the work through an approved, qualified subcontractor and shall include the full cost for same in his bid.

3.03 LUBRICATION

A. Provide all lubrication for the operation of the mechanical equipment until acceptance by the Owner. Contractor shall be responsible for all damage to bearings up to the date of acceptance of the equipment. Protect all bearings and shafts during installation. Thoroughly grease steel shafts to prevent corrosion. Provide covers as required for proper protection of all motors and other equipment during construction.

3.04 COORDINATION

A. Install work to avoid interference with work of other trades including, but not limited to, architectural and electrical trades. Remove and relocate any work that causes an interference at Contractor's expense. Disputes regarding the cause of an interference shall be resolved by the Architect and/or Engineer.

3.05 CHASE, SHAFTS AND RECESSES

A. Coordinate with structural, architectural and other trades to ensure accurate location and size of chases, shafts and recesses required for mechanical systems.

3.06 SLEEVES

A. Provide and install Schedule 40 black steel pipe sleeves, cut to length, wherever pipes pass through above grade walls and floors. Provide and install galvanized steel pipe sleeves, cut to length, wherever pipes pass through below grade foundation walls and slab on grade floors. Sleeves shall terminate flush with walls in finished areas. All sleeves through the floor are to extend two (2) inches above finish floor.

B. Provide escutcheons at each penetration through walls, floors, and ceilings in exposed areas.

C. Patch sleeves to match building material.

3.07 SEALING OF MECHANICAL OPENINGS

A. Seal the space around pipes in sleeves and around duct openings through walls, floors and ceilings.

B. Refer to specification 078400-Firestopping.

C. Provide adequate clearance to allow for proper duct/pipe movement and sealing.

D. Provide/install fireproof wall and floor sleeves as required by applicable building codes at all applicable wall, ceiling, and floor penetrations. Refer to Architectural plans for wall assembly ratings.

E. Penetrations through fire rated floors and walls shall be fire-stopped in accordance with applicable building code requirements with UL and FMRC approved materials and shall have a fire rating equal to or greater than the fire partition rating. Refer to architectural plans for locations and assembly ratings.

1. Packing: Refractory fiber or ceramic fiber.

a. Manufacturers:

1) Carborundum Fiberfrax.

2) Johns-Manville - Cerafelt.

3) Eagle Picher Epitherm 1200.

4) Babcock and Wilcox Kaowool.

2. Fire stop sealant.

a. Manufacturers:

1) Hilti

2) Tremco

3) Mameco

4) Pecora

3. Where combustible pipes, tubes, vents, etc. penetrate a fire rated assembly, such penetrations shall be protected by an approved through-penetration fire stop collar/sealant system per the building code.

a. Through -penetration firestop systems shall be tested in accordance with ASTM E814 with a minimum positive pressure differential of 0.01 inch WG. Through penetration firestop systems shall have a "F" rating and a "T" rating of not less than 1 hour but not less than the required rating of the assembly penetrated.

b. Hilti CP 642 Firestop Collar.

c. Hilti FS-ONE High Performance Intumescent Firestop Sealant.

d. 3M Fire Barrier PPD Plastic Pipe Device.

e. 3M Fire Barrier Intumescent Firestop Sealant.

3.08 CUTTING, CORING AND PATCHING

A. Refer to General Conditions.

B. Unless specifically noted otherwise, the Contractor shall perform all cutting, coring, and patching that may be necessary for the installation of their Work. All cutting, coring, patching and repair work shall be performed by the Contractor through qualified Subcontractors. Contractor shall include full cost of same in his bid.

C. Secure approval form Architect and/or Structural Engineer, in writing, before cutting, welding/bolting to, or anchoring from any structural building components (i.e. structural steel, load bearing walls, footings/foundations, concrete floors/ceilings, etc.).

3.10 EQUIPMENT FOUNDATIONS AND SUPPORTS

A. For equipment suspended form ceiling or walls, furnish and install all inserts, rods, structural steel frames, brackets and platforms required. Obtain approval of Architect and/or Structural Engineer for same including loads, locations, and methods of attachment.

3.11 EQUIPMENT CONNECTIONS

A. Make connections to equipment, fixtures and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufactures of the particular equipment furnished.

B. All piping connections to equipment shall be flanged or shall be made with unions to facilitate equipment removal.

C. All piping connections to pumps, coils, and other equipment shall be installed without strain at the pipe connection of this equipment.

D. Brass unions for connections of 2 inch and less and flanged union with dielectric gasket and bolt sleeves for 2-1/2 inch and greater shall be used for equipment connections of dissimilar metals.

E. All ductwork connections to air handling equipment shall be made with flexible duct connectors.

3.12 ACCESSIBILITY

A. All equipment shall be installed so as to be readily accessible for operation, maintenance, and repair, as required by the equipment manufacturer and as subject to the approval of the Engineer.

3.13 ACCESS DOORS

A. The Contractor, and/or his Subcontractors, shall provide access doors for access to any of their respective mechanical equipment (i.e. valves, controls, coils, motors, air vents, filters, equipment, etc.) that is installed in inaccessible areas. Provide access doors in the walls, as required to make all electrical boxes, controls and other equipment installed by the Contractor accessible. In the walls, provide Milcor No. "DW" or "M" as required to make all equipment installed by the Contractor accessible. Minimum size 12 inches x 12 inches. In the ceiling, provide Milcor N. 3210, 3105 or 3206 for accessibility as mentioned above, 24 inches x 24 inches minimum size. The plaster or acoustical tile insert shall be by the architectural trades. Areas with accessible ceilings (ceilings where tiles are not fastened in place and can be individually removed without removal of adjacent tiles) will not require access doors.

B. Refer to Architectural specifications for manufacturer's and model numbers and additional information.

C. The Contractor, and/or his Subcontractors, shall be responsible for quantities of access doors and shall receive approval for locations from the Architect and/or Engineer prior to installation.

D. The Contractor, and/or his Subcontractors, shall purchase appropriate access doors, coordinate locations, and shall pay for installation by a qualified architectural subcontractor.

E. When access doors are in fire resistant walls or ceilings, they must bear the Underwriters' Laboratories, Inc., Label, with time design rating equal to or exceeding that of the wall or ceiling unless they were a part of the tested assembly.

3.14 CLEANING

A. Each trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.

B. After equipment, ductwork, piping systems have been completed and tested, each entire system shall be cleaned and flushed.

C. Prior to connection of new piping to existing piping systems, all new piping shall be subject to initial flushing, cleaning and final flushing. Provide temporary bypass piping and fittings, temporary valves and strainers, temporary water make-up piping with approved means of backflow prevention, and temporary pumps as needed to perform specified flushing and cleaning requirements.

3.15 PAINTING

A. All mechanical systems, equipment, piping, ductwork, etc. exposed in finished areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect.

3.16 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Electrical equipment furnished by Mechanical Trades and installed by Electrical Trades shall be turned over to Electrical Trades in good condition.

B. Equipment and materials shall be protected from theft, injury or damage.

C. Materials with enamel or glaze surface, shall be protected from damage by covering and/or coating as recommended in bulletin, "Handling and Care of Enameled Cast Iron Plumbing Fixtures," issued by the Plumbing Fixtures Manufacturers Association, and as approved.

D. Coat polished or plated metal parts with white petroleum jelly immediately after installation.

E. Protect equipment outlets, pipe and duct openings with temporary plugs or caps.

F. Provide adequate storage for all equipment and materials delivered to the job site. Equipment set in place in unprotected areas must be provided with temporary protection.

3.18 GENERAL SUPPORT REQUIREMENTS

A. Each mechanical trade shall provide all required supporting components to properly support their work. Supporting components/systems shall be in accordance with Code and as specified.

B. Provide all necessary angle/brackets or supplementary steel as required for adequate support for all piping, ductwork, specialties, and equipment. Secure approval form Architect and/or Engineer, in writing, before welding or bolting to steel framing or anchoring to concrete structure.

C. Where piping, ductwork, specialties, or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

3.19 PIPING INSTALLATION IN PLENUM SPACES

A. Pipe and pipe fittings installed in mechanical air plenum spaces shall of non-combustible materials. If PVC piping is specified as an approved material, it shall be wrapped with at least 1.5 inches of non-combustible insulation plus continuous vapor barrier which meet building code required smoke and flame spread ratings.

B. Coordinate location of mechanical plenum spaces with electrical trades for plenum rated cable requirements.

3.20 PIPING SYSTEMS TESTING

A. Test backflow prevention at connections between potable water and nonpotable water for proper functioning under normal operating conditions. Provide Owner with one (1) copy of the potable water backflow prevention test report.

B. Pressure test hydronic piping (i.e. heating water, chilled water, heat pump water, condenser water, etc.) in accordance with governing and applicable codes. At minimum, test with water at 225 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

3.21 DRAWINGS AND MEASUREMENTS

A. These specifications and accompanying drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either the drawings or specifications shall be as binding as if call for by both. The work herein described shall be complete in every detail.

B. The Drawings are not intended to be scaled for rough-in measurements, nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor. The Contractor shall check latest architectural drawings to locate equipment/fixtures/etc., check latest structural drawings for interferences, etc..

3.22 EXTRA WORK

A. For any extra work which may be proposed, the Contractor shall furnish to the General Contractor/Construction Manager, an itemized breakdown of the estimated cost of all materials and labor required to complete this work. The estimate cost breakdown shall include unit prices (same prices for increase/decrease of work) for all materials (i.e. duct, piping, valves, equipment, equipment rental, etc.) and all labor (i.e. manhours, overtime, etc.) which may be required for any proposed extra work. The Contractor shall not proceed until receiving a written order from the General Contractor establishing the agreed price and describing the work to be done.

3.23 DEMOLITION WORK

A. All demolition of existing mechanical equipment and materials shall be done by the Contractor

unless otherwise indicated. Included are all items such as, but not limited to, existing piping, pumps, ductwork, supports and equipment where such items are not required for the proper operation of the modified system.

B. In general, demolition work is indicated on the drawings. However, the Contractor shall visit the job to determine the full extent and character of this work.

C. The Contractor shall review all other contract documents (i.e. architectural plans, electrical plans, etc.) to review the extent of demolition and remodeling work.

D. Unless specifically noted to the contrary, removed materials shall not be reused in the work. Salvaged materials that are to be reused shall be stored safe against damage and turned over to the appropriate trade for reuse. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived. Remove items from the systems and turn over to the Owner in their condition prior to removal. The Owner shall move and store these materials. Items on which the Owner waives ownership shall become the property of the Contractor, who shall remove and legally dispose of, away from the premises.

E. Work that has been cut or partially removed shall be protected against damage until covered by permanent construction.

F. Clean and flush the interior and exterior of all existing relocated equipment and its related piping, valves, and accessories that are to be reused of all mud, debris, pipe dope, oils, welding slag, loose mill scale, rust and other extraneous material so that the existing equipment and all accessories can be repainted and repaired as required to place in first-class working condition.

G. Where existing equipment is to be removed, cap piping under floor, behind face of wall, above ceiling or at mains.

H. Provide sheet metal caps on ductwork and cap piping immediately adjacent to demolition as soon as demolition commences in order to allow existing systems to remain in operation. Caps shall be of same material as service requiring such.

3.24 WORK IN EXISTING BUILDINGS

A. The Owner will provide access to existing buildings as required. Access requirements to occupied buildings shall be identified on the project schedule. The Contractor, once work is started in the existing building, shall complete same without interruption so as to return work areas as soon as possible to Owner.

B. Adequately protect and preserve all existing and newly installed work. Promptly repair any damage to same at Contractor's expense.

C. Consult with the Architect and/or Engineer as to the methods of carrying on the work so as not to interfere with the Owner’s operation any more than absolutely necessary. Accordingly, all service lines shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the Architect and/or Owner's Representative.

3.25 ACCEPTANCE PROCEDURE

A. Upon successful completion of start-up and recalibration, but prior to building acceptance, substantial completion and commencement of warranties, the Architect and/or Engineer shall be requested in writing to inspect the satisfactory operation of all mechanical control systems.

B. The Contractor shall demonstrate operation of equipment and control systems, including each individual component, to the Architect and/or Engineer and Owner.

C. After correcting all items appearing on the punch list, make a second written request to the Architect and/or Engineer for inspection and approval.

D. After all items on the punch list are corrected and formal approval of the plumbing/mechanical systems is provided by the Architect and/or Engineer, the Contractor shall indicate to the Owner in writing the commencement of the warranty period.

E. If testing, adjusting, and balancing of a mechanical system cannot take place due to seasonal weather, all parties involved (i.e. mechanical contractor and test/balance agency, and manufacturer's representative) shall return to the site during season required to properly test, adjust and balance the equipment. An example of this would be a heating system installed and tested in the cooling season (summer). Due to the fact that there may not be enough heating load required to properly test the boiler, all parties shall return to the site the following heating season (winter) to test, adjust, and balance the heating system.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC SYSTEMS AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.
B. Tags.
C. Pipe Markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.
B. Air Terminal Units: Tags.
C. Automatic Controls: Tags. Key to control schematic.
D. Control Panels: Nameplates.
E. Ductwork: Plastic Tape Duct Markers.
F. Heat Transfer Equipment: Nameplates.
G. Instrumentation: Tags.
H. Major Control Components: Nameplates.
I. Piping: Pipe markers.
J. Pumps: Nameplates.
K. Small-sized Equipment: Tags.
L. Thermostats: Nameplates.
M. Valves: Tags.

2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.
B. Champion America, Inc.: www.Champion-America.com.
C. Seton Identification Products: www.seton.com/aec.

2.03 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: Conform to ANSI/ASME A13.1, unless specified otherwise.
   2. Letter Height: 1/2 inch.
   3. Background Color: Conform to ANSI/ASME A13.1, unless specified otherwise.

2.04 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

2.05 PIPE MARKERS

A. Color: Conform to ASME A13.1.
B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.06 DUCT MARKERS

A. Plastic Tape Duct Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.
B. Verify Owner's existing identification standard and provide new identification to match.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
B. Install tags with corrosion resistant chain.
C. Install plastic pipe markers in accordance with manufacturer's instructions.
D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
E. Identify mechanical equipment (i.e. air handling units, pumps, terminal units, exh. fans, etc.) with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
F. Identify control panels and major control components outside panels with plastic nameplates.
G. Identify thermostats relating to terminal boxes or valves with nameplates.
H. Identify valves in main and branch piping with tags.
I. Identify air terminal units and radiator valves with numbered tags.
J. Tag automatic controls, instruments, and relays. Key to control schematic.
K. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and unique pressure or temperature if necessary to distinguish between other systems. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction. Arrows and markers shall be mounted to provide unobstructed visibility from floor level.
L. Identify ductwork (i.e. Supply Air, Return Air, Outdoor Air, Fresh Air, Exhaust Air, etc.) with plastic tape duct markers. Identify with air handling unit identification number and area served. Locate identification on ductwork at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction, at each riser, and at straight runs not to exceed 20' apart.
M. Paint exposed piping and ductwork per specification section 09900.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

1.02 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council.

B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau.

1.03 SUBMITTALS

A. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

B. Sample Report Forms: Submit two sets of sample TAB report forms.

C. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
2. Submit draft copies of report for review prior to final acceptance of Project.
    a. Provide final copies for ENGINEER and for inclusion in operating and maintenance manuals.
3. Provide reports in .pdf format, complete with cover identification and TOC/Index. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
6. Units of Measure: Report data in I-P (inch-pound) units only.
7. Test Reports: Indicate data on AABC MN-1 forms, NEBB forms, or forms containing information indicated in Schedules.
8. Include the following on the title page of each report:

a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project ENGINEER.
g. Project Engineer.
h. Project CONTRACTOR.
i. Project altitude.
j. Report date.

F. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
1. AABC MN-1, AABC National Standards for Total System Balance.
2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
3. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having minimum of five years documented experience.
3. Certified by one of the following:
a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
c. NBC, National Balancing Council: www.nbctab.org.

3.02 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

B. The mechanical contractor shall provide to the TAB sub-contractor all shop drawings, submittal data, up-to-date revisions, change orders, bulletins, and other data required for the planning, preparation, and execution of the TAB work.

C. The mechanical contractor shall provide startup personnel to assist the TAB sub-contractor in

testing, adjusting, and balancing work.

D. If testing, adjusting, and balancing of a mechanical system cannot take place due to seasonal weather, all parties involved (i.e. mechanical contractor and test/balance agency) shall return to the site during season required to properly test, adjust and balance the equipment. An example of this would be a heating system installed and tested in the cooling season (summer). Due to the fact that there may not be enough heating load required to properly test and balance the heating systems, all parties shall return to the site the following heating season (winter) to test, adjust, and balance the heating system.

E. All test points, balance valves, mechanical identification, etc. shall be complete and accessible to the TAB sub-contractor.

3.03 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Access doors are closed and duct end caps are in place.
9. Air outlets are installed and connected.
10. Duct system leakage is minimized.
11. Hydronic systems are flushed, filled, and vented.
12. Pumps are rotating correctly.
13. Service and balance valves are open.

B. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual specification sections have been performed.

C. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

D. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

E. Examine equipment for installation and for properly operating safety interlocks and controls.

F. 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.

G. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

H. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.

3.04 PREPARATION

A. Hold a pre-balancing meeting 3 weeks prior to starting TAB work.

1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations.

C. Prepare a TAB plan that includes strategies and step-by-step procedures.

D. Perform the following field tests and inspections to new and renovated portions of duct systems according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:

1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg.

4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

E. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Equipment and duct access doors are securely closed.

3. Balance, smoke, and fire dampers are open.

4. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

5. Windows and doors can be closed so indicated conditions for system operations can be met.

3.05 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.06 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or

areas as selected and witnessed by the OWNER.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.07 AIR SYSTEM PROCEDURE

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts, or use reduced scale contract documents with notations.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Cut insulation, and drill ducts for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes with neat patches, neoprene plugs, threaded plugs, or threaded twist-on metal caps, and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check for proper sealing of air duct system.

K. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

L. Make air quantity measurements in ducts by Pitot tube traverse of entire cross-sectional area of duct.

M. Measure air quantities at air inlets and outlets.

N. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

O. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

P. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

Q. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

R. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

S. Adjust automatic dampers, outside air dampers, return air dampers, and exhaust dampers for design conditions.

T. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

U. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

V. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.08 PROCEDURES FOR CONSTANT VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Do not recommend fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow at a point downstream from the balancing damper and adjust volume dampers until the proper airflow is achieved.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.09 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in

conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.10 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:
   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure space pressure of at least 10 percent of locations.
   c. Verify that balancing devices are marked with final balance position.
   d. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.11 SCOPE

A. Test, adjust, and balance the following:

1. Terminal Heat Transfer Units (FTRs, CUHs, UHs, etc.)
2. Air Handling Units
3. Fans
4. Air Terminal Units
5. Air Inlets and Outlets (GRDs)

3.12 MINIMUM DATA TO BE REPORTED

A. Items:

1. Fan Data:
   a. System identification.
   b. Location.
   c. Make and type.
   d. Model number and size.
   e. Manufacturer's serial number.
   f. Arrangement and class.
   g. Sheave make, size in inches, and bore.
   h. Sheave dimensions, center-to-center, and amount of adjustments in inches.
2. Electric Motors:
   a. Manufacturer
   b. Model/Frame
   c. HP/BHP
   d. Phase, voltage, amperage; nameplate, actual, no load
   e. RPM
   f. Service factor
   g. Starter size, rating, heater elements
   h. Sheave Make/Size/Bore
3. Air Moving Equipment:
   a. Location
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Arrangement/Class/Discharge
   f. Air flow, specified and actual
   g. Return air flow, specified and actual
   h. Outside air flow, specified and actual
   i. Total static pressure (total external), specified and actual
   j. Inlet pressure
   k. Discharge pressure
   l. Sheave Make/Size/Bore
   m. Number of Belts/Make/Size
   n. Fan RPM
4. Return Air/Outside Air:
   a. Identification/location

b. Design air flow
c. Actual air flow
d. Design return air flow
e. Actual return air flow
f. Design outside air flow
g. Actual outside air flow
h. Return air temperature
i. Outside air temperature
j. Required mixed air temperature
k. Actual mixed air temperature
l. Design outside/return air ratio
m. Actual outside/return air ratio

5. Exhaust Fans:
   a. Location
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Air flow, specified and actual
   f. Total static pressure (total external), specified and actual
   g. Inlet pressure
   h. Discharge pressure
   i. Sheave Make/Size/Bore
   j. Number of Belts/Make/Size
   k. Fan RPM
6. Duct Leak Tests:
   a. Description of ductwork under test
   b. Duct design operating pressure
   c. Duct design test static pressure
   d. Duct capacity, air flow
   e. Maximum allowable leakage duct capacity times leak factor
   f. Test apparatus
      1) Blower
      2) Orifice, tube size
      3) Orifice size
      4) Calibrated
   g. Test static pressure
   h. Test orifice differential pressure

i. Leakage

7. VAV Air Terminal Unit Data:
   a. Manufacturer
   b. Type, constant, variable, single, dual duct
   c. Identification/number
   d. Location
   e. Model number
   f. Size
   g. Minimum static pressure
   h. Minimum design air flow
   i. Maximum design air flow
   j. Maximum actual air flow
   k. Inlet static pressure
8. Air Distribution Tests (Grilles, Registers, Diffusers):
   a. Air terminal number
   b. Room number/location
   c. Terminal type
   d. Terminal size
   e. Area factor
   f. Design velocity
   g. Design air flow
   h. Test (final) velocity
   i. Test (final) air flow
   j. Percent of design air flow

END OF SECTION

SECTION 23 0713

DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

1.02 REFERENCE STANDARDS

A. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

B. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

C. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

D. ASTM C 1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.

G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

H. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than 10 years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 10 years of experience and approved by manufacturer.

C. Insulation types and thickness shall be as required to meet current energy code standards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

1.07 INSULATION OF EXISTING SYSTEMS

A. On renovation/addition projects where existing ductwork systems are being modified the existing ductwork systems shall be reinsulated as required to maintain sealed insulation/vapor barrier.

B. After completion of any required asbestos abatement, reinsulate all existing systems.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Where insulation and covering is specified or required to include a vapor barrier, it is critical that the integrity of the vapor barrier is continuously maintained. Fasteners or other securing devices that may unintentionally penetrate, or damage, the vapor barrier are prohibited. Where fasteners must penetrate the vapor barrier, the vapor barrier shall be repaired.

2.02 GLASS FIBER, FLEXIBLE (EXTERIOR DUCT WRAP)

A. Manufacturer:

1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C 553; flexible, noncombustible blanket.

1. 'K' value: 0.29 at 75 degrees F, when tested in accordance with ASTM C 518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.
4. Maximum Density: 1.5 lb./cu ft.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.058 ng/Pa s m (0.04 perm inch), when tested in accordance with ASTM E 96/E 96M.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive. The use of duct tape is prohibited.

E. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gage.

2.03 GLASS FIBER, RIGID (EXTERIOR BOARD DUCT INSULATION)

A. Manufacturer:

1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.

4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C 612; rigid, noncombustible blanket.

1. 'K' value: 0.31 at 75 degrees F, when tested in accordance with ASTM C 518.
2. Maximum service temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent.
4. Maximum Density: 3.0 lb./cu ft.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.058 ng/Pa s m (0.04 perm inch), when tested in accordance with ASTM E 96/E 96M.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive. The use of duct tape is prohibited.

E. Indoor Vapor Barrier Finish:

1. Vinyl emulsion type acrylic, compatible with insulation, white color.

F. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.04 DUCT LINER (Enhanced Surface Fiberglass)

A. Manufacturers:

1. CertainTeed Corporation; ToughGard R Duct Liner with Enhanced Surface: www.certainteed.com.

B. Insulation: Incombustible glass fiber complying with ASTM C 1071; NAIMA and NFPA 90A/90B; rigid board; impregnated surface and edges coated with enhanced surface which is 40% more water repellent than standard fiberglass duct liner.

1. Apparent Thermal Conductivity: Maximum of ASTM C518, 0.24 at 75 degrees F.
2. Service Temperature: Up to 250 degrees F.
3. Rated Velocity on Coated Air Side for Air Erosion: 6,000 fpm, minimum.
4. Density: 1.5 lb./cu.ft. for 1", 1.5", and 2" thickness. 2 lb./cu.ft. for 1/2" thickness.
5. Minimum Noise Reduction Coefficients (NRC) per ASTM E795:
   a. 1/2 inch Thickness: 0.45.
   b. 1 inch Thickness: 0.70.
   c. 1-1/2 inches Thickness: 0.90.
   d. 2 inch Thickness: 1.00.
6. Corrosion Resistance: pass ASTM C665.
7. Bacteria Resistance: pass ASTM G22.
8. Fungal Resistance: pass ASTM C1338 & ASTM G21.
9. Water Repellency Rating > 4 (INDA IST 80.6-92).

C. Adhesive: Waterproof, fire-retardant type.

D. Liner Fasteners: Galvanized steel, impact applied with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:

1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:

1. Provide with standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
3. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

E. Ducts Exposed in Finished Spaces: Insulate with rigid glass fiber insulation and finish with canvas jacket sized for finish painting or aluminum jacket. Refer to specification section 09900 - Coordinate color with Architect.

F. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
5. Continue insulation through wall penetrations using rigid fiberglass insulation 6 inches on either side of wall.

G. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 100 percent coverage. All exposed edges of duct liner shall be coated with the same adhesive. All rips and tears shall be repaired using adhesive. Severely damaged areas of duct liner and duct liner which have been wetted shall be replaced entirely.
2. Secure fiberglass duct liner insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.

4. Seal liner surface penetrations with adhesive.
5. All internal duct areas shall be covered with duct liner. Traverse joints shall be firmly butted with no gaps, and coated with adhesive. Longitudinal corner joints shall be overlapped and compressed.
6. Metal nosing shall be applied to all upstream transverse edges to additionally secure the insulation.
7. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

A. Supply Air Ducts and Fresh Air:

1. Flexible Glass Fiber Duct Insulation: 1.5 inches thick.
2. Rigid Glass Fiber Duct Insulation: 1.5 inches thick.

B. Ductwork passing through walls (6 inches on either side of wall):

1. Rigid Glass Fiber Duct Insulation: 1.5 inches thick.

C. Supply air ductwork within 10 feet of air terminal unit discharge:

1. Rigid Glass Fiber Duct Liner Insulation: 1.5 inches thick.
2. Note that ducts lined with duct liner are not required to have additional external duct insulation, except for ducts in unconditioned attics or crawl spaces which shall be provided with exterior insulation specified.

D. Ceiling Plenum Return Air Transfer Ductwork, and Return Air Grill Sound Traps:

1. Rigid Glass Fiber Duct Liner Insulation: 1.0 inches thick.
2. Note that ducts lined with duct liner are not required to have external duct insulation, except for ducts in unconditioned attics or crawl spaces which shall be provided with exterior insulation specified.

END OF SECTION

SECTION 23 0719

HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Insulation jackets.

1.02 REFERENCE STANDARDS

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].

C. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.

D. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

E. ASTM C 449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

F. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

G. ASTM C 533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

H. ASTM C 534/C 534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

I. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation.

J. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

K. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

L. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.

M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than 10 years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 10 years of experience.

C. Insulation types and thickness shall be as required to meet current energy code standards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

B. Store insulation in original wrapping and protect from weather, dirt, chemicals, and damage.

1.06 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

1.07 INSULATION OF EXISTING SYSTEMS

A. On renovation/addition projects where existing piping systems are being modified the existing piping systems shall be reinsulated as required to maintain sealed insulation/vapor barrier.

B. After completion of any required asbestos abatement, reinsulate all existing systems.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 GLASS FIBER

A. Manufacturers:

1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.

1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.
4. Density: 3.5 lb./cu. ft.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches. Secure with self-sealing longitudinal laps and butt strips.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:

1. Compatible with insulation as recommended by insulation manufacturer.

F. Insulating Cement/Mastic:

1. ASTM C 195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz./sq. yd. weight.
2. Blanket: 1.0 lb./cu ft. density.

H. Indoor Vapor Barrier Finish:

1. Vinyl emulsion type acrylic, compatible with insulation, black color.

I. Insulating Cement:

1. ASTM C 449/C 449M.

2.05 JACKETS

A. PVC Plastic.

1. Manufacturers:

a. Johns Manville Corporation: www.jm.com.

b. Knauf.

c. Ceel-Co..

d. Certain Teed.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.

d. Thickness: 10 mil.

e. Connections: Brush on welding adhesive.

f. Maximum Flame Spread: ASTM E84; 25.

g. Maximum Smoke Developed: ASTM E84; 50.

h. Jacket shall be ultraviolet-resistant.

i. Jackets shall meet USDA and FDA requirements where applicable.

3. Covering Adhesive Mastic:

a. Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

C. Equipment nameplates, identification tags, etc. shall not be covered by insulation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations. Install PVC jackets and fitting covers. Paint to match finishes. Refer to specification section 09900 - Coordinate color with Architect.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic. Vapor barrier shall be continuous.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

3. Provide calcium silicate inserts or other heavy density insulating material suitable as

approved by the Engineer for the planned temperature range, where pipes pass through walls, sleeves, pipe hangers/rollers, and other pipe penetrations.

4. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints. Bevel and seal ends of insulation. Provide removable insulation access sections to permit access and removal of unions, flanges, and strainer baskets. Access sections shall be capable of removal and replacement with no damage to adjacent insulation.

D. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Finish with tape and white paintable vapor barrier jacket.

4. Provide calcium silicate inserts or other heavy density insulating material suitable as approved by the Engineer for the planned temperature range, where pipes pass through walls, sleeves, pipe hangers/rollers, and other pipe penetrations.

5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints. Bevel and seal ends of insulation.

E. Provide removable insulation covers for providing access/removal of unions, flangesexpansion joints, etc. Access sections shall be capable of removal and replacement with no damage to adjacent insulation.

F. Inserts and Shields:

1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts. All piping, all sizes, shall have shields installed between the pipe hangers and insulation or inserts.

2. Insert Application: Piping 1 inches diameter or larger.

3. Insert location: Between support shield and piping and under the finish jacket.

4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert material: Hydrous calcium silicate insulation (or other heavy density insulating material, as approved by the Engineer, for the planned temperature range).

G. Continue insulation through walls, sleeves, pipe hangers/rollers, and other pipe penetrations. Install steel sleeves at all wall and floor penetrations. Finish at supports, protrusions, and interruptions. At fire separations, fire caulk per building code requirements.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

I. Ends of insulation shall be sealed off. Spray paint is not acceptable. There shall be no exposed ends.

J. Insulation not properly installed shall be removed and replaced or repaired as necessary.

K. Insulation on hot surfaces shall be applied while the surfaces are hot to avoid breaking of insulation during expansion of piping.

3.03 SCHEDULE

A. Heating Systems:

1. Heating Water Supply and Return; Terminal Unit Heating Supply and Return; Energy Recovery Loop Supply and Return:
   a. Glass Fiber Insulation:
      1) Pipe Size Range: Up to 4 inches.
         a) Thickness: 1.0 inch.
      2) Pipe Size Range: Over 4 inches.
         a) Thickness: 1-1/2 inches.

END OF SECTION

SECTION 23 2113

HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and pipe fittings for:

1. Heating water piping system (HWHS/HWHR).

1.02 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.

B. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.

E. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.9).

F. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

H. ASTM B 32 - Standard Specification for Solder Metal.

I. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.

J. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

K. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel.

M. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

N. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

1.03 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Use non-conducting dielectric connections whenever jointing dissimilar metals.

D. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-69 unless indicated otherwise.

E. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

F. Use characterized ball valves valves for throttling, bypass, or manual flow control services.

G. Use 3/4 inch gate or ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

H. Purge all air from the system during start-up.

I. Provide vents, with manual vent valves, at all high points in the system. Purge all air from the system during start-up.

1.04 SUBMITTALS

A. Project Record Documents: Record actual locations of control valves.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum 10 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with documented experience.

C. Welder Qualifications: Certify in accordance with ASME (BPV IX).

D. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

E. Pressure test all hydronic piping (i.e. heating water) in accordance with governing and applicable codes. At minimum, test with water at 225 PSIG - permissible pressure drop shall be 0 PSIG over 2 hour period.

F. Material shall be certified by NSF International as complying with NSF 14, and ASTM F 2389 or CSA B137.11.

1.06 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

C. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.

2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
3. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

C. Pipe-to-Control Valve and Pipe-to-Equipment Connections: Use flanges, or unions, to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated, and as follows:

1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap; pipe to nearest floor drain.
2. Isolate equipment using ball valves.
3. For throttling, bypass, or manual flow control services, use characterized ball valves.
4. In heating water, chilled water, or condenser water systems, butterfly valves may be used interchangeably with gate and globe valves.
5. For shut-off and to isolate parts of systems or vertical risers, use ball, or butterfly valves.

E. Welding/Brazing/Soldering Materials and Procedures: Conform to ASME (BPV IX).

2.02 HEATING WATER PIPING (HWHS, HWHR), ABOVE GROUND

A. Steel Pipe, Sizes 10 Inch and Less: ASTM A 53/A 53M, Schedule 40, black, using one of the following joint types:

1. Welded Joints: ASTM A 234/A 234M, wrought steel welding type fittings; AWS D1.1 welded.
2. Threaded Joints (2” and smaller): ASTM B 16.3, malleable iron fittings.
3. Fittings: ASTM B 16.3, malleable iron; ASTM A 536, cast ductile iron; or ASTM A 234/A 234M, wrought steel welding type fittings.
4. Joints:
   a. ANSI/AWS D1.1 welded.

B. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A) annealed. Allowed for sizes 3 inch and smaller.

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
   a. Solder: ASTM B 32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   b. Braze: AWS A5.8/A5.8M BCuP copper/silver alloy.
2. Joints: Solder, lead free, ASTM B 32, 95-5 tin-antimony, or tin and silver.

C. Minimum System Pressure Rating: 175 psig.

2.03 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B 32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
2. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.

B. PVC Pipe: ASTM D 1785, Schedule 40, or ASTM D 2241, SDR 21 or 26.(where allowed by code).

1. Fittings: ASTM D 2466 or D2467, PVC.
2. Joints: Solvent welded.

2.04 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.9.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon steel, adjustable swivel, split ring.

C. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

G. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

H. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

I. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

J. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

K. Vertical Support: Steel riser clamp.

L. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

M. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

N. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

O. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

P. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.05 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:

1. Ferrous Piping: 150 psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 Inches:

1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16 inch thick preformed neoprene.

C. Dielectric Connections: Union or waterway fitting with galvanized or plated steel threaded end, grooved end, copper solder end, water impervious isolation barrier.

2.06 BALL VALVES

A. Manufacturers:

1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc.: www.nibco.com.

3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Keystone.

B. Up To and Including 2 Inches:

1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends with union.

C. Over 2 Inches:

1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment using jointing system specified.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

E. After completion, fill, clean, and treat systems. Refer to Section 23 2500 for additional requirements.

F. Coordinate control valve installation with controls sub-contractor.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water piping to ASME B31.9 requirements.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Slope piping and arrange to drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

J. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9, ASTM F 708, or MSS SP-89.
2. Support horizontal piping as scheduled.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 9000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0719.

L. Provide access where valves and fittings are not exposed.

M. Use eccentric reducers to maintain top of pipe level.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

O. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting in “finished” areas. Refer to Section 09 9000.

P. Install valves with stems upright or horizontal, not inverted.

Q. Branch piping run-outs to loads (i.e. tempering coils, radiators, unit heaters, etc.) shall be minimum 3/4" diameter unless noted otherwise.

R. Provide vents, with manual vent valves, at all high points in the system. Purge all air from the system during start-up.

3.03 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.
5. 3 inch: Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. 4 inch: Maximum span, 12 feet; minimum rod size, 1/2 inch.

B. Hanger Spacing for Steel Piping.

1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.

7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. 6 inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.

END OF SECTION

SECTION 23 2300

REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Valves.

C. Strainers.

D. Check valves.

E. Pressure relief valves.

F. Filter-driers.

G. Expansion valves.

H. Receivers.

I. Flexible connections.

1.02 REFERENCE STANDARDS

A. AHRI 750 - Standard for Thermostatic Refrigerant Expansion Valves; Air-Conditioning, Heating, and Refrigeration Institute.

B. AHRI 760 - Standard for Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; Air-Conditioning, Heating, and Refrigeration Institute.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ANSI/ASHRAE Std 15).

D. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..

E. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.

G. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes; The American Society of Mechanical Engineers.

H. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; The American Society of Mechanical Engineers.

I. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.9).

J. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

K. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.

L. ASTM B 280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

M. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

N. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel.

P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

Q. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

R. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

1.03 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:

1. Use line size liquid indicators in main liquid line leaving condenser.
2. If receiver is provided, install in liquid line leaving receiver.
3. Use line size on leaving side of liquid solenoid valves.

D. Valves:

1. Use service valves on suction and discharge of compressors.
2. Use gage taps at compressor inlet and outlet.
3. Use gage taps at hot gas bypass regulators, inlet and outlet.
4. Use check valves on compressor discharge.
5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:

1. Use line size strainer upstream of each automatic valve.
2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
3. On steel piping systems, use strainer in suction line.
4. Use shut-off valve on each side of strainer.

G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.

H. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
2. Use sealed filter-driers in low temperature systems.
3. Use sealed filter-driers in systems utilizing hermetic compressors.
4. Use filter-driers for each solenoid valve.

I. Replaceable Cartridge Filter-Driers:

1. Use vertically in liquid line adjacent to receivers.

2. Use filter-driers for each solenoid valve.

J. Solenoid Valves:

1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Use in liquid line of single or multiple evaporator systems.
3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

K. Receivers:

1. Use on systems with long piping runs.

L. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.04 SUBMITTALS

A. Test Reports: Indicate results of leak test, acid test.

B. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

C. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

D. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 10 years of documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

C. Welders Certification: In accordance with ASME (BPV IX).

D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

1.08 MAINTENANCE PRODUCTS

A. Provide two refrigeration oil test kits each containing everything required to conduct one test.

B. Provide two filter-dryer cartridges of each type.

PART 2 PRODUCTS

2.01 PIPING (RFL, RFS)

A. Copper Tube: ASTM B 280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8 inch OD: ASTM B 88 (ASTM B 88M), Type K (A), annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Joints: Flared.

C. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black.
   1. Fittings: ASTM A 234/A 234M, wrought steel welding type.
   2. Joints: Welded in accordance with AWS D1.1.

D. Pipe Supports and Anchors:
   1. Conform to ASME B31.5, ASTM F 708, MSS SP-58, MSS SP-69, and MSS SP-89.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Vertical Support: Steel riser clamp.
   7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   10. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.02 MOISTURE AND LIQUID INDICATORS

A. Manufacturers:
   1. Henry Technologies: www.henrytech.com.
   2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com.
   3. Sporlan Valve Company: www.sporlan.com.

B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.03 VALVES

A. Manufacturers:
   1. Hansen Technologies Corporation: www.hantech.com.
   2. Henry Technologies: www.henrytech.com.
   3. Danfoss Flomatic: www.flomatic.com.

B. Diaphragm Packless Valves:
   1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat

disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Packed Angle Valves:

1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

D. Ball Valves:

1. Two piece forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 325 degrees F.

E. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.04 STRAINERS

A. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.05 CHECK VALVES

A. Manufacturers:

1. Hansen Technologies Corporation: www.hantech.com.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com.
3. Sporlan Valve Company: www.sporlan.com.

B. Globe Type:

1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 500 psi.

C. Straight Through Type:

1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 250 degrees F.

2.06 PRESSURE REGULATORS

A. Manufacturers:

1. Hansen Technologies Corporation: www.hantech.com.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com.
3. Sporlan Valve Company: www.sporlan.com.

B. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi range, for maximum working pressure of 450 psi.

2.07 PRESSURE RELIEF VALVES

A. Manufacturers:

1. Hansen Technologies Corporation: www.hantech.com.
2. Henry Technologies: www.henrytech.com.
3. Sherwood Valve/Harsco Corporation: www.sherwoodvalve.com.

B. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi.

2.08 SOLENOID VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com.
3. Sporlan Valve Company: www.sporlan.com.

B. Valve: AHRI 760, pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi.

C. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.09 EXPANSION VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com.
3. Sporlan Valve Company: www.sporlan.com.

B. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with replaceable capillary tube and remote sensing bulb and remote bulb well.

C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Circuit Hydraulics, Ltd: www.circuit-hydraulics.co.uk.
2. Flexicraft Industries: www.flexicraft.com.
3. Penflex: www.penflex.com.

B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with equipment manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Route piping from indoor coils to outdoor condensing units thru ceiling space, walls, etc…as required. Sleeve RFS/RFL piping thru conduit sleeves at all walls/ceilings/etc. and fire caulk as required. Maintain access to piping/valves where required for maintenance.

G. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

H. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Provide copper plated hangers and supports for copper piping.

I. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

J. Provide clearance for installation of insulation and access to valves and fittings.

K. Provide access to concealed valves and fittings.

L. Flood piping system with nitrogen when brazing.

M. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

N. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 9000.

O. Insulate piping and equipment; refer to Section 230719.

P. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

Q. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

R. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

S. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

T. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

U. Fully charge completed system with refrigerant after testing.

V. Provide electrical connection to solenoid valves. Refer to Section 26 2717.

3.03 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using electronic leak detector. Test to no leakage.

3.04 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. 2-5/8 inch OD: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. 3-1/8 inch OD: Maximum span, 10 feet; minimum rod size, 3/8 inch.
8. 3-5/8 inch OD: Maximum span, 11 feet; minimum rod size, 1/2 inch.
9. 4-1/8 inch OD: Maximum span, 12 feet; minimum rod size, 1/2 inch.

B. Hanger Spacing for Steel Piping.

1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.

END OF SECTION

SECTION 23 2500

HVAC WATER TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleaning of piping systems.

B. Chemical treatment.

1.02 SUBMITTALS

A. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

B. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

C. Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

D. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 10 years of experience and approved by manufacturer.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. AmSolv/Division of Amrep, Inc.: www.amsolv.com.

B. GE Water Technologies: www.gewater.com.

C. Enerco Corp..

2.02 GENERAL

A. Provide and install chemical cleaning and treatment for the entire hydronic system(s). Provide all necessary treatment chemicals, equipment, shot feeder(s), meter(s), filter(s), control equipment, service, etc. for start-up and operation of hydronic system(s).

B. All systems/equipment are based upon Enerco Corp. (Grand Ledge, MI 800-292-5908).

2.03 MATERIALS

A. System Cleaner:

1. Manufacturers:

a. AmSolv/Division of Amrep, Inc.: www.amsolv.com.

b. GE Water Technologies: www.gewater.com.

c. Enerco Corp..

2. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodium tripoly phosphate and sodium molybdate.

3. Biocide chlorine release agents such as sodium hypochlorite or calcium hypochlorite, microbiocides such as quarternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

B. Closed System Treatment (Water):

1. Manufacturers:

a. AmSolv/Division of Amrep, Inc.: www.amsolv.com.

b. GE Water Technologies: www.gewater.com.

c. Nalco Company: www.nalco.com.

d. Enerco Corp..

2. Sequestering agent to reduce deposits and adjust pH; polyphosphate.

3. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

4. Conductivity enhancers; phosphates or phosphonates.

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

D. Chemical treatment contractor shall coordinate with equipment manufacturers (i.e. boilers, chillers, etc.) and verify treatment requirements (i.e. propleyne vrs ethylene glycol, approved cleaner chemicals, etc.) prior to treating systems.

3.02 CLEANING SEQUENCE

A. Hydronic Pre-cleaning:

1. Thoroughly flush entire system with fresh water. Remove and clean all strainers, open drip legs, or other non-flowing piping to remove debris.

2. Determine loop capacity in gallons, taken from the water meter readings, by carefully filling the loop from completely drained to completely full with all air bled out of the system. Submit written report of pre-cleaning and system capacity to the water treatment sub-contractor and Owner.

B. Concentration:

1. As recommended by manufacturer.

C. Hot Water Heating Systems:

1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.

2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.

3. Circulate for 6 hours at design temperatures, then drain.
4. Refill with clean water and repeat until system cleaner is removed.

D. Remove, clean, and replace strainer screens.

E. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 CLOSED SYSTEM TREATMENT

A. Introduce closed system treatment through existing bypass pot-feeder.

END OF SECTION

SECTION 23 3100

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

1.02 REFERENCE STANDARDS

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.

D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

E. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association.

F. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 10 years of documented experience.

1.04 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.05 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

1.06 COORDINATION REQUIREMENTS

A. Sheet metal trades shall coordinate all design, construction, and installation with all other trades.

B. Sheet metal trades shall cooperate with the Test and Balance Contractor and provide all miscellaneous caps and any other materials required for structural integrity and leakage testing of the complete ductwork system. Refer to Test and Balance specification section.

1.07 DESIGN REQUIREMENTS

A. Duct sizes shown on drawings are inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. Variation of duct configuration or sizes is permitted, so long as the interior area is not reduced. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

C. Use material, weight, thickness, gauge, construction and installation methods as outlined in the

latest addition of the following SMACNA publications, unless noted otherwise:

1. HVAC Duct Construction Standards, Metal and Flexible
2. HVAC Air Duct Leakage Test Manual
3. HVAC Systems - Duct Design
4. Rectangular Industrial Duct Construction
5. Round Industrial Duct Construction

D. Use products which conform to NFPA 90A, possessing a flame spread rating of less than 25 and a smoke developed rating of less than 50.

1.08 PRESSURE DEFINITIONS

A. Low Pressure Ductwork: Up to 2 inches WG and velocities less than 1,500 fpm. Construct for 2 inch WG positive and negative or positive static pressures.

B. Medium Pressure Ductwork: Greater than 2 inches WG up to 6 inches WG and velocities greater than 2,500 fpm. Construct for 6 inch WG positive and negative or positive static pressures.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. All Ducts: Galvanized steel, unless otherwise indicated.

B. Medium Pressure Supply (Heating Systems) – Upstream of Terminal Units: 6 inch w.g. pressure class, galvanized steel.

C. Medium Pressure Supply (System with Cooling Coils) – Upstream of Terminal Units: 6 inch w.g. pressure class, galvanized steel.

D. Low Pressure Supply (Heating Systems) – Downstream of Terminal Units: 2 inch w.g. pressure class, galvanized steel.

E. Low Pressure Supply (System with Cooling Coils) – Downstream of Terminal Units: 2 inch w.g. pressure class, galvanized steel.

F. Return and Relief: 2 inch w.g. pressure class, galvanized steel.

G. General Exhaust: 1 inch w.g. pressure class, galvanized steel.

H. Outside Air Intake: 1 inch w.g. pressure class, galvanized steel.

I. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class, galvanized steel with acoustical duct liner.

2.02 MATERIALS

A. General: Non-combustible ducts, conforming to Class 1 air duct materials, or UL 181.

B. Galvanized Steel Ducts: ASTM A 653/A 653M galvanized steel sheet, Forming Steel (FS) designation, with G90/Z275 zinc coating.

1. Gaskets: Chloroprene elastomer, 40 Durometer, 1/8 inch thick, full face, one piece vulcanized or dovetail at joints.

2. All reinforcement for ducts having a side dimension 48" or less shall be external. Internal reinforcement shall be acceptable only for ducts having a side dimension greater than 48 inches. Reinforcement shall be provided per SMACNA standards.

C. Steel Ducts - Galvanized Round and Flat Oval Spiral: Galvanized sheet steel duct and fittings, lock forming quality per ASTM A527, Coating Designation G-90, factory fabricated, lock seam or welded design in accordance with SMACNA HVAC Duct Construction Standards or SMACNA

Industrial Duct Construction Standards as required based on pressure class. Flat oval and round fittings shall be factory fabricated welded design. Use of field fabricated fittings (welded design) shall only be permitted when factory fabricated fittings are unavailable.

1. Manufacturers:
   a. Dixi-Bilt.
   b. Semco.
   c. LaPine Metal Products.
   d. United-McGill.
   e. Univarsal Spiral Air.

D. Insulated Flexible Ducts, Low and Medium Pressure:

1. Flexible Ducts: Interlocking spiral of galvanized steel or aluminum construction or fabric supported helically wound spring steel wire or flat steel bands; rated to 6 inches WG positive and 4 inches negative for low and medium pressure ducts.
2. Insulated Flexible Ducts: Flexible duct wrapped with flexible fiber glass insulation, enclosed in a fire retardant polyethylene vapor barrier jacket; maximum 0.23 K value at 75 deg F.
3. Acoustical performance tested in accordance with the Air Diffusion Council's "Flexible Air Duct Test Code FD 72-R1."
4. Flexible Duct Fittings: Galvanized steel, twist in design with damper.
5. Manufacturer's:
   a. Flexmaster Type 8M, UL 181, Class 1.
   b. Automation Industries Thermaflex.
   c. Hart & Cooley.

E. Caulk: Elastomer caulk, UL listed and per NFPA 90A.

F. Zinc Paint:

1. Manufacturers:
   a. Carboline "Galvanox No. 1."
   b. Tnemec.
   c. Welco "Cold Galv."

G. Heat Shrinkable Sealant: Heat shrinkable polyethylene bands with heat softening epoxy for round slip fit duct joints. For use on all round seal Class A joints with exception of polyvinyl chloride coated ductwork.

H. Sealant: Indoor/outdoor water based duct sealant. UL listed, non-toxic, water resistant, 0 smoke/flame spread, compatible with mating materials, for use on all SMACNA seal Class A, B, and C joints, for use on 1/2 - 10" wg SMACNA pressure classes.

1. Manufacturers:
   a. Hardcast "Duct-Seal #321" or Equal.

I. Reinforcing and Supports:

1. Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim, and angles for support of ductwork.
2. Welded reinforcement and supports shall be structural steel black iron painted with zinc rich paint.

3. Screwed type and supports shall be structural steel per ASTM A36; Mill galvanized steel per ASTM A123. Fabricated sheet steel per ASTM A527, coating designation G-90.
4. Flanges in contact with the airstream shall be of the same material as the ductwork.
5. Bolts and fasteners for galvanized steel duct work shall be carbon steel, zinc coated per ASTM A153.
6. All hangers shall provide a means of vertical adjustment after erection.

J. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

A. Low Pressure Ductwork (+/- 2 " W.G. Static Pressure Class)

1. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
2. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
3. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
4. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
5. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

B. Medium and High Pressure Ductwork (For Static Pressure Class greater than +/- 2 " W.G.)

1. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards or SMACNA Industrial Duct Construction Standards as required based upon pressure class and ASHRAE handbooks. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
2. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
3. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
4. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
5. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.04 DUCT MANUFACTURERS

A. Metal-Fab, Inc.

B. Semco, Inc.

C. United McGill Corporation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Install in accordance with manufacturer's instructions.

C. Flexible Ducts: Connect to metal ducts with liquid adhesive plus tape.

D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot 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.

G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

I. Use double nuts and lock washers on threaded rod supports.

J. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

K. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

L. Provide flexible duct connections where ductwork connects to fans, air handling equipment, and other rotating equipment and/or where indicated on the drawings.

M. Provide straight runs of ductwork at fans, coils, air terminal units, and other equipment per manufacturer’s recommendations.

N. Where ducts pass through fire rated walls or floor dividing conditioned spaces from unconditioned spaces, provide a flanged duct-segment for installation during the time of construction to provide a tight seal.

O. Where ducts pass through walls and floors, finish wall openings with metal trim strips and curb floor openings. Wood frames are not permitted.

P. Install airfoil turning vanes in all rectangular mitered elbows, whether indicated on drawings or not.

3.02 DUCTWORK FABRICATION

A. Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect and/or Engineer in the event of any interferences.

B. Fabricate necessary offsets and transitions to avoid interference with building construction, piping, equipment, etc. Make changes, offsets, etc. for duct obstructions per SMACNA HVAC Duct Construction Standards or SMACNA Industrial Duct Construction Standards as required based upon pressure class. However, do not reduce duct to less than 6 inches in any dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes, beams, or other similar obstructions through ducts, construct easement as indicated in SMACNA HVAC Duct Construction Standards or SMACNA Industrial Duct Construction Standards. In all cases, seal to prevent air leakage.

C. Fabricate ductwork to prevent failure under pressure or vacuum created by fast closure of ductwork devices. Provide leaktight automatic relief devices where required.

D. Ducts or plenums of masonry construction are not acceptable.

E. Repair galvanized surfaces damaged by the application of zinc rich paint per manufacturer's instructions.

3.03 DUCT LEAKAGE

A. The maximum allowable total leakage rate for duct systems shall be 5% of their associated fan and/or air handling unit CFM.

3.04 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION

SECTION 23 3300

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Duct access doors.

C. Duct test holes.

D. Fire dampers.

E. Flexible duct connections.

F. Volume control dampers.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.

B. NFPA 92A - Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences.

C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc..

E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc..

F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

1. Product data for Fire and Fire/Smoke Dampers:

a. Include UL ratings for fire resistance, leakage, velocity, differential pressure and elevated temperature.

b. Indicate materials, construction, and dimensions.

c. Verify conformance to NFPA, CSFM, IBC, UL, and applicable building code as specified in Quality Assurance.

d. Include pressure drop data for all damper sizes in accordance with AMCA 500-D test figures 5.2 (Ducted Inlet, Free Outlet), 5.3 (Ducted Inlet, Ducted Outlet) and 5.5 (Free Inlet, Free Outlet).

e. Include a copy of UL Installation Instructions.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors, and duct test holes.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.04 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors and test holes.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. Fire and Fire/Smoke Dampers:

1. Dampers shall meet requirements for combination fire smoke dampers in accordance with:

a. NFPA 80, 90A, 92A, 92B, and 101.

b. CSFM Fire Damper Listing.

c. CSFM Leakage (Smoke) Damper Listing.

d. Applicable Building Codes.

2. Dampers shall be tested, rated, and labeled in accordance with:

a. UL 555, Listing R13317

b. UL 555S, Listing R13317

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

B. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:

1. Krueger: www.krueger-hvac.com.

2. Ruskin Company: www.ruskin.com.

3. Titus: www.titus-hvac.com.

4. Nailor.

B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.02 DUCT ACCESS DOORS

A. Manufacturers:

1. Nailor Industries Inc.: www.nailor.com.

2. Ruskin Company: www.ruskin.com.

3. SEMCO Incorporated: www.semcoinc.com.

4. Air Balance Inc..

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Access doors with sheet metal screw fasteners are not acceptable.

D. Provide access doors at all fire dampers, control dampers, and all temperature control equipment.

E. Provide kitchen exhaust ductwork access openings and doors per NFPA - 96.

2.03 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.04 FIRE DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc.: www.louvers-dampers.com.
2. Nailor Industries Inc.: www.nailor.com.
3. Ruskin Company: www.ruskin.com.
4. Greenheck.

B. Refer to architectural drawings for wall construction and fire ratings.

C. Fire dampers shall be installed where shown and noted on the plans and in all ducts passing through designated fire rated assemblies. Refer to architectural plans for fire rated assembly types and locations.

D. Fire dampers shall bear the UL label.

E. Fire dampers shall be minimum 1-1/2 hour rated, but shall meet requirements for wall construction and fire ratings.

F. All fire dampers shall be "dynamic" rated.

G. All fire dampers shall have heavy gauge, aluminum, airfoil blades.

H. All fire dampers shall be installed in the same manner in which they were tested.

I. When fire dampers cannot be installed in a fire rated assembly being protected, install fire damper in a 10 gauge steel sleeve, and extend sleeve through opening in fire rated assembly being protected with retaining angles, in manner approved by State and local fire marshalls.

J. Provide access doors to all fire dampers.

K. Fire dampers located in low pressure ductwork shall be UL listed with type "B" frame providing a minimum 95% free area.

L. Fire dampers located in medium and high pressure ductwork shall be UL listed fusible link, single or double curtain type with type "C" frame with frame and damper completely out of the air stream.

M. Location of fire dampers shall be such that the damper housing is integral with the fire wall. Access panels to the fusible links shall be located such that the fusible link and damper can be maintained and shall be suitable for temperatures of 150 degrees F, and pressure of 6 inches WG.

N. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

O. Horizontal Dampers: Aluminum, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

P. Curtain Type Dampers: Heavy gauge aluminum with airfoil blades. Provide stainless steel closure springs and latches for horizontal installations or closure under air flow conditions. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

Q. Multiple Blade Dampers: 16 gage aluminum and airfoil blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed

linkage, stainless steel closure spring, blade stops, and lock.

R. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers. Fusible links for fire dampers in kitchen hood exhaust ductwork shall separate at 286 degrees F.

2.05 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz. per sq. yd.

a. Net Fabric Width: Approximately 3 inches wide.

2. Metal: 3 inches wide, 24 gage thick galvanized steel.

C. Manufacturers:

1. Ventfabrics, Inc. "Ventglas."

2. Pathway.

3. Duro-Dyne.

2.06 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc.: www.louvers-dampers.com.

2. Nailor Industries Inc.: www.nailor.com.

3. Ruskin Company: www.ruskin.com.

4. American Warming and Ventilating Inc.

5. Greenheck.

6. NCA Manufacturing.

7. Air Balance Inc.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Splitter Dampers:

1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.

2. Blade: Fabricate of double thickness sheet metal to streamline shape, secured with continuous hinge or rod.

3. Operator: Minimum 1/4 inch diameter rod in self-aligning, universal joint action, flanged bushing with set screw.

D. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. End Bearings: Except in round ducts 6 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearing.

G. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of automatic control dampers provided by controls sub-contractor.

B. Examine areas to receive dampers. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization of dampers. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 3100 for duct construction and pressure class.

B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

C. Provide duct test holes where indicated and required for testing and balancing purposes.

D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

G. 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.

H. Fire and Fire/Smoke damper installation:

1. Provide fire dampers and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges. Refer to architectural plans for wall construction and fire/smoke ratings.
2. Dampers must be accessible to allow inspection, adjustment, and replacement of components. The sheet metal contractor shall furnish any access doors in ductwork or plenums required to provide this access. The general contractor shall furnish any access doors required in walls, ceilings, or other general building construction.
3. Install dampers square and free from racking.
4. The installing contractor shall provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure.
5. Do not compress or stretch the damper frame into the duct or opening.
6. Attach multiple damper section assemblies together in accordance with manufacturer’s instructions. Install support mullions as reinforcement between assemblies as required.

7. Handle dampers using the frame or sleeve. Do not lift or move dampers using blades, actuator or jackshaft.
8. Demonstrate re-setting of fire dampers to OWNER's representative.
9. Coordinate location and quantities of Smoke Duct Detectors required for Fire/Smoke dampers, and combination fire/smoke dampers, with electrical and fire alarm trades.

END OF SECTION

SECTION 23 3700

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

1.02 REFERENCE STANDARDS

A. ADC 1062: GRD - Test Code for Grilles, Registers & Diffusers; Air Diffusion Council.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc..

C. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc..

D. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, make, model, finish, location, air quantity, pressure drop, neck or jet velocity, throw, diffusion range, and noise level.

1. Throw shall be the horizontal distance from the diffuser to the point where the theoretical centerline velocity is 50 feet per minute. The throw scheduled shall not exceed the horizontal distance between the diffuser and the nearest wall, or half the distance between ceiling diffusers.

2. Identify Grilles/Registers/Diffusers using the designations used in the drawings and specifications.

3. Sound data shall be given in terms of sound power level in octave bands 2 through 8, and NC index for the capacity range of the diffuser.

B. Project Record Documents: Record actual locations of air outlets and inlets.

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes Company HVAC: www.carnes.com.

B. Krueger: www.krueger-hvac.com.

C. Price Industries: www.price-hvac.com.

D. Titus: www.titus-hvac.com.

2.02 DIFFUSERS, REGISTERS, AND GRILLS - GENERAL

A. Refer to schedules on drawings for quantities, types, finishes, and manufacturer's model numbers of diffusion devices.

B. Air diffusion devices have been chosen in terms of specific air distribution requirements, spacing, and sound characteristics. Provide ADC certified manufacturer's standard devices.

C. Provide plaster frames for diffusers installed in plaster ceilings.

D. Install wall mounted supply registers six (6) inches below ceiling, unless noted otherwise.

E. Diffusers shall be standard off-white baked enamel finish, unless noted otherwise. Contractors shall coordinate diffuser colors with architect prior to ordering. Provide air diffusion device interior surfaces, including blank-offs, with black matte finish.

F. Coordinate frame types with architectural reflected ceiling plan.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers/grilles to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9000.

END OF SECTION

SECTION 26 0001

GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Division includes all labor, materials, equipment, tools, supervision, start-up services, Owner's Instructions, including all incidental and related items necessary to complete installation and successfully test and start up and operate the Electrical Systems indicated on Drawings and described in each Section of Division 26 Specifications, and applicable Division 28 Specifications, and conforming with ALL other Contract Documents.

B. The Drawings and General Provisions of the Contract, including the General Conditions, Supplementary General Conditions, and Division 1 specification sections, apply to work of Division 26 sections. The items in this section are not intended to supersede, but are supplementary to, the requirements set forth in other Divisions of the specifications.

C. The Contractor, and his Subcontractors and Suppliers, shall include in their bid all materials, labor, and equipment involved, in accordance with all local customs, codes, rules, regulations; and secure compliance of all parts of the Specifications and Drawings regardless of Sectional inclusion in these Specifications.

D. The Contractor shall be responsible for the complete and satisfactory accomplishment of all Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation, and demonstrate that all electrical systems will operate satisfactorily under normal operating conditions.

1.02 DRAWINGS & SPECIFICATIONS

A. The drawings are diagrammatic and show the general location and arrangement of equipment, outlets, lights and related electrical items. They shall be followed as closely as elements of the construction will permit. The Contractor shall provide/install all electrical systems, and associated equipment, complete and include all necessary wire/conduit, pull boxes, and other components required due to interferences, space constraints, code requirements, etc. as required to provide a complete/functional system.

B. These General Electrical Requirements are intended to augment the drawings and specifications. Should conflicts occur between the drawings and the specifications, the strictest provision shall govern. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect and/or Engineer for resolution prior to rough-in.

C. The Contractor shall examine the drawings of all other trades in order to verify the conditions governing the work on the job site. Arrange work accordingly, providing all wiring, conduit, fittings, boxes, etc. as may be required to meet such conditions.

D. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect and/or Engineer.

E. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect and/or Engineer for resolution.

1.03 COORDINATION OF WORK

A. The Contractor shall verify clearance requirements of all electrical and mechanical

equipment/systems prior to the installation of any new work. Electrical equipment, wiring, systems, etc. shall not interfere with mechanical equipment spaces. The Contractor shall coordinate his work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, etc. are coordinated and are installed per the Architectural reflected ceiling plan.

B. The Contractor, and their Subcontractors, shall be responsible for all tasks applicable to their work in accordance with the Specifications, Drawings, and code requirements, and shall be responsible for coordinating locations and arrangements of their work to give best results with all other relevant trades.

1. Coordinate their work to obtain symmetry in ceiling layouts, so that sprinkler heads, lights, diffusers, etc. are coordinated and are installed per the Architectural reflected ceiling plan.
2. Coordinate all wall, roof, floor penetrations, equipment locations, system routings, etc. with architectural and structural trades.
3. Verify requirements of all equipment with shop drawing submittals prior to installation - notify Architect/Engineer of any conflicts between shop drawings and plans prior to rough-in.
4. Coordinate rough-in locations and mounting heights of all devices with locations/heights of countertops/sinks/furniture/cabinets/etc. with Architectural Elevations and other trades prior to rough-in.
5. Coordinate rough-in locations of mechanical control devices (i.e. thermostats, sensors, etc.) with mechanical trades. E.C shall provide rough-in of box for T-stat/Sensor and conduit pathway from box to mechanical unit's control box, for wiring by M.C and/or T.C.. T-stats/sensors shall be located @ 48" AFF unless noted otherwise.
6. Coordinate locations of electrical items that require access (i.e. panelboards, starters, pull boxes, etc.) with reflected ceiling plan. Items located above hard non-accessible ceilings shall be provided with access doors as required.
7. Verify clearance requirements of all mechanical, electrical, plumbing equipment/systems prior to the installation of any new work. Electrical equipment, lighting, conduit, systems, etc. shall not interfere with mechanical equipment spaces. Mechanical/plumbing equipment, piping, ductwork, systems, etc. shall not interfere with electrical equipment spaces.

1.04 INSPECTION OF SITE AND PROJECT DOCUMENTATION

A. The Contractor shall visit the site and examine/verify the conditions under which the work must be conducted before submitting proposal. The Contractor shall examine the drawings and specifications of all other trades including Mechanical, Architectural, Structural, Plumbing, and Electrical.

B. The submitting of a proposal implies that the Contractor has visited the site, examined all contract documents, and understands the conditions under which the work must be conducted.

C. The Contractor shall notify the Architect and/or Engineer, via written RFI prior to submitting his bid, of any potential conflicts/problems with the plans that he has identified during his inspection of the site and/or from the review of plans/specifications. RFIs must be submitted at least 5 working days prior to bid opening.

1.05 GENERAL SUPPORT REQUIREMENTS

A. Provide all necessary angle/brackets or supplementary steel as required for adequate support for all conduit, lighting, specialties, and equipment. Secure approval form Architect and/or Structural Engineer, in writing, before welding or bolting to steel framing or anchoring to concrete structure, or cutting/coring thru structural systems.

B. Where conduit or equipment is supported or suspended from concrete construction, provide approved concrete inserts in formwork to receive hanger rods, such as Unistrut or Powerstrut, and where installed in metal deck, use Ramset or Welds as required.

1.06 GUARANTEE

A. Contractor shall guarantee that all labor, materials, and equipment are free from defects and agrees to replace or repair any part of this installation which becomes defective within a period of one year from the date of substantial completion following final acceptance, provided that such failure is due to defects in the equipment, material or installation. Acceptance date of substantial completion shall be Owner occupancy as determined by the Architect and/or Engineer.

B. The Contractor shall file with the Owner one set of guarantees from the equipment manufacturers including the operating conditions and performance capacities they are based on.

1.07 CODES, PERMITS AND FEES

A. Refer to Division 1, General Requirements and Supplementary Conditions.

B. Unless otherwise indicated, all required permits, plan reviews, licenses, inspections, approvals and fees for electrical work shall be secured and paid for by the Contractor.

C. All work shall be executed in accordance with the latest enforceable rules and regulations set forth in local and state codes.

1. Electrical systems shall be installed per current jurisdictional codes (Michigan Electrical Code, Michigan Energy Code, etc.), current NFPA codes (NFPA 101, NPFA 90, NFPA 72, etc.), and applicable sections of the Michigan Building Code.

D. In the event that the plans and specifications conflict with any rules, regulations, or codes applying, said rules, regulations and codes shall govern.

E. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

F. Contractor shall prepare any detailed drawings or diagrams which may be required by the governing authorities (i.e. fire alarm plans, emergency lighting layouts/photometric calcs, etc.) for plan review/permit approval.

1.08 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

A. All items that the Contractor proposes to use in the work, that are not specifically named in the contract documents, must be submitted for review/approval. Such items must be submitted in .pdf format to the Architect and/or Engineer for approval a minimum of seven (7) days prior to bid opening. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations. The Contractor shall call out/illustrate to the Engineer any/all differences between the basis of design and the Contractor's proposed substitution items.

B. Lighting Substitutions:

1. Furnish lighting fixtures as scheduled on drawings.

2. Lighting fixture substitutions may be considered for approval by the Architect and/or Engineer only if all of the following criteria are met:

a. Provide specification cut sheets marked-up to clearly identify the proposed luminaire including features, options, accessories, etc. required to match products indicated in the schedules.

b. Submit all cut sheets, calculations, etc. to the Architect and/or Engineer no less than 7 days prior to bid date. Substitutions submitted after this date will not be considered.

1.09 MATERIAL AND EQUIPMENT MANUFACTURERS

A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of electrical equipment and shall be the manufacturer's latest design.

B. If equipment by an approved manufacture is other than the equipment specified as the basis of design the substituted equipment shall be equal in quality, durability, appearance, capacity and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Substitution Items Requiring Prior Approval specified in this Section of the Specifications. All costs to make these items of equipment comply with original requirements including, but not limited to, conduit, wiring, bus work, enclosures, and building alterations shall be included in the original bid.

1.10 SHOP DRAWINGS

A. Refer to Division 1, General Requirements.

B. All shop drawings shall be submitted in groupings by specification section (i.e. 262416-Panelboards, 262726-Wiring Devices, etc.) and of similar and/or related items. Incomplete submittal groupings will be returned unchecked.

C. Unless noted otherwise, submit electronically in digital .pdf form, copies of complete manufacturer's shop drawings for all electrical equipment, or systems, including but not limited to, the items listed below. Where items are referred to by symbolic designation on the drawings and specifications, all submittals shall bear the same designation. Refer to other Sections of the electrical specifications for additional requirements.

1. 26 0923 Lighting Control Devices
2. 26 0923.13 Lighting Controls – Wavelinx Wireless System
3. 26 2416 Panelboards
4. 26 2726 Wiring Devices
5. 26 5100 Interior Lighting
6. 28 3100 Fire Detection and Alarm

1.11 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

A. Refer to Division 1, General Requirements.

B. Provide compete maintenance and operating instructional manuals covering all electrical equipment as specified herein, and individual equipment specification sections.

C. The O&M data shall be bound in a suitable number of 3" or 4", 3-ring, hard cover binders. Permanently imprinted on the cover shall be the words, "Manufacturer's Operation and Maintenance Data", project title, location of project, and the date. A table of contents shall be provided in the front of each binder.

D. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Each piece of equipment in the O&M manual shall be identified as identified on the project drawings (i.e. Transformer T-1, Distribution Panel DP-1, etc.).

E. Internally subdivide the binder contents with permanent page dividers, organized by specification section and/or major equipment/systems (i.e. 265100_INTERIOR LIGHTING, 283100_FIRE DETECTION AND ALARM, etc.).

F. Contents: Each volume of O&M manual shall have three parts:

1. Part 1: A directory listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: O&M data, arranged and subdivided by major equipment/systems. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers:
    a. List of equipment.
    b. Copies of Shop drawings and product data, approved by Architect/Engineer.
    c. Installation and operational procedures.
    d. Routine maintenance procedures.
    e. Trouble shooting procedures.
    f. Complete parts lists by nomenclature, manufacturer's part number and use.
    g. Recommended spare parts lists.
    h. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
    i. Complete wiring and schematic diagrams.
    j. Elevations and/or sections cut through all of the major equipment and sub-assemblies.
3. Part 3: Project documents and certificates, including the following:
    a. Warranty certificates.
    b. Copies of approved construction permits.
    c. Contractor's and equipment manufacturer's telephone numbers for warranty repair services.

G. Two (2) Maintenance and Operating manuals shall be provided, in digital .pdf format, to the Architect and/or Engineer for review when construction is 75% complete.

H. A minimum of two (2) hard copies, as well as digital .pdf format, of all approved Operation and Maintenance literature shall be furnished to the Owner within 10 days after final inspection. O&M manuals must be completed prior to start of Owner training as the manuals shall be used as the basis of the training.

1.12 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection the Contractor shall instruct Owner's designated personnel in operation, adjustment and maintenance of electrical equipment and systems at agreed upon times.

B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

C. Use Operation and Maintenance Manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.13 RECORD DRAWINGS

A. Contractor shall submit to the Architect and/or Engineer, record drawings which have been neatly marked to represent as-built conditions for all new electrical work.

B. The Contractor shall keep accurate note of all deviations from the construction documents and discrepancies in the concealed conditions and other items of construction on field drawings as they occur. Proper circuiting, conduit runs, location and number of electrical devices shall be indicated on the "as-built" drawings. The marked up field documents shall be available for

review by the Architect, Engineer and Owner at their request.

PART 2 PRODUCTS

2.01 MATERIALS

A. All material and equipment furnished and installed by the Contractor for the permanent Work shall be new, unused, of the best quality of make specified, shall be free from defects of any character, and shall be listed as approved by the UL and/or FM.

B. Outdoor electrical equipment shall be weatherproof, NEMA 3R or NEMA 4X (stainless steel), unless otherwise indicated.

C. Unless otherwise specified in other Division 26 sections, the sheet metal surfaces of equipment enclosures shall be coated with a rust resisting primer. Over the primer, a corrosion resistant baked enamel finish shall be applied. The color shall be ASA No. 49, medium light gray.

PART 3 EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. Install equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the Architect and/or Engineer for resolution.

3.02 CHASE, SHAFTS AND RECESSES

A. Coordinate with architectural and other trades to ensure accurate location and size of chases, shafts and recesses.

3.03 CUTTING, CORING AND PATCHING

A. Refer to General Conditions.

B. The Contractor shall perform all cutting, coring, and patching that may be necessary for the installation of their Work. All cutting, coring, patching and repair work shall be performed by the Contractor through qualified Subcontractors. Contractor shall include full cost of same in his bid.

C. Secure approval form Architect and/or Structural Engineer, in writing, before cutting, welding/bolting to, or anchoring from any structural building components (i.e. structural steel, load bearing walls, footings/foundations, concrete floors/ceilings, etc.).

3.04 EQUIPMENT SUPPORTS

A. For equipment suspended from ceiling or walls, furnish and install all inserts, rods, structural steel frames, brackets and platforms required. Obtain approval of Architect and/or Structural Engineer for same including loads, locations, and methods of attachment.

3.05 SLEEVES

A. Provide and install Schedule 40 black steel pipe sleeves, cut to length, wherever conduits pass through above grade walls and floors. Provide and install galvanized steel pipe sleeves, cut to length, wherever conduits pass through below grade foundation walls and slab on grade floors. Sleeves shall terminate flush with walls in finished areas. All sleeves through the floor are to extend two (2) inches above finish floor.

B. Provide escutcheons at each penetration through walls, floors, and ceilings in exposed areas.

C. Patch sleeves to match building material.

3.06 SEALING OF ELECTRICAL OPENINGS

A. Seal the space around conduits in sleeves through walls, floors and ceilings.

B. Refer to specification 078400-Firestopping.

C. Provide adequate clearance to allow for proper sealing.

D. Provide/install fireproof wall and floor sleeves as required at all applicable wall, ceiling, and floor penetrations. Refer to Architectural plans for wall assembly ratings.

E. Sleeves placed in floors shall be flush with the underside of the floor construction and shall have planned, square ends, extending 2 inches above the finished floor, unless otherwise noted or detailed.

F. Where sleeves pass through reinforced concrete floors, they shall be properly set in position prior to concrete pouring in such a way that they will be maintained in position until the concrete is set.

G. Conduits passing through below grade perimeter walls or slabs on grade shall have the space between the pipe and sleeve sealed watertight with a mechanically expandable elastomer seal device.

3.07 FIRESTOP MATERIALS

A. Refer to specification 078400-Firestopping.

B. Use only firestop products that have been tested according to ASTM E-814 and UL 1479 for the conditions set forth regarding construction assembly type, penetrating item type, annular space requirements and fire rating.

C. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in other related specification sections.

1. For non-combustible penetrations including conduit not passing through a sleeve, the following materials are acceptable:
   a. Hilti FS 601 Elastmeric Firestop Sealant.
   b. 3 M.
   c. CSD Sealing Systems.
   d. Firestop Systems.
2. For non-combustible penetrations including sleeved conduits, the following materials are acceptable:
   a. Hilti FS 601 Elastmeric Firestop Sealant.
   b. 3 M.
   c. CSD Sealing Systems.
   d. Firestop Systems.
3. For combustible penetrations including cables and cable bundles, the following materials are acceptable:
   a. Hilti FS 611A Intumescent Firestop Sealant.
   b. 3 M.
   c. CSD Sealing Systems.
   d. Firestop Systems.
4. For large or complex penetrations involving multiple conduits, cable trays, electrical bussway, etc. the following materials are acceptable:
   a. Hilti FS 635 Firestop Compound.
   b. 3 M.
   c. CSD Sealing Systems.
   d. International Protective Coatings - KBS Sealbags.

3.08 EQUIPMENT CONNECTIONS

A. Make connections to equipment, fixtures and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufactures of the particular equipment furnished. All additional connections not shown on the drawings, but called out by the equipment manufacturer's shop drawings, shall be provided at no additional cost.

3.09 CLEANING

A. Each Trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.

B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

3.10 INSTALLATION IN PLENUM SPACES

A. Equipment and systems installed in mechanical return air plenum spaces shall of non-combustible materials which meet building code required smoke and flame spread ratings.

B. Coordinate location of mechanical plenum spaces with mechanical trades for plenum rated cable requirements.

1. Per the Mechanical Plans the entire 2nd floor ceiling space is a return air plenum

3.11 PAINTING

A. All electrical systems, equipment, conduit, etc. exposed in finished areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect

3.12 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Equipment and materials shall be protected from theft, injury or damage.

B. Protect equipment outlets, pipe and duct openings with temporary plugs or caps.

C. Provide adequate storage for all equipment and materials delivered to the job site. Equipment set in place in unprotected areas must be provided with temporary protection.

3.13 ACCESSIBILITY

A. All equipment shall be installed so as to be readily accessible for operation, maintenance, and repair, as required by the equipment manufacturer and as subject to the approval of the Engineer.

3.14 NAMEPLATES AND DIRECTORIES

A. Identify switchgear, unit substations, motor controls, panelboards, safety switches, etc., with manufacturer's nameplate, shop order, where applicable on composite assemblies, and designations used on the Drawings. Nameplates shall be laminated phenolic plastic, beveled edged white with engraved black letters. Except where impractical, letter and numerals shall be a minimum of 1/2 inch high. Nameplates shall be mechanically secured. Pressure sensitive nameplates are not acceptable. Panel directories shall be neatly typed, showing equipment served and location for each breaker or switch with a clear plastic protective cover.

3.15 EXTRA WORK

A. Refer to Division 1, General Requirements.

B. For any extra electrical work which may be proposed, the Electrical Contractor shall furnish to the General Contractor/Construction Manager, an itemized breakdown of the estimated cost of all materials and labor required to complete this work. The estimate cost breakdown shall include unit prices (same prices for increase/decrease of work) for all materials (i.e. wire, conduit,

devices, equipment, equipment rental, etc.) and all labor (i.e. manhours, overtime, etc.) which may be required for any proposed extra work. The Contractor shall not proceed until receiving a written order from the General Contractor establishing the agreed price and describing the work to be done.

3.16 DRAWINGS AND MEASUREMENTS

A. These specifications and accompanying drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either the drawings or specifications shall be as binding as if call for by both. The work herein described shall be complete in every detail.

B. The Drawings are not intended to be scaled for rough-in measurements, nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor. The Contractor shall check latest architectural drawings to locate light switches, check latest structural drawings for interferences, etc.

3.17 DEMOLITION AND REMOVAL WORK

A. All demolition of existing electrical equipment and materials shall be done by the Contractor unless otherwise indicated.

B. In general, demolition work is indicated on the drawings. However, the Contractor shall visit the job to determine the full extent and character of this work.

C. The Contractor shall review all other contract documents (i.e. architectural plans, mechanical plans, etc.) to review the extent of demolition and remodeling work.

D. Unless specifically noted, removed materials shall not be reused in the work. Salvaged materials that are to be reused shall be stored safe against damage and turned over to the appropriate trade for reuse. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived. Remove items from the systems and turn over to the Owner unless such ownership is waived. Items on which the Owner waives ownership shall become the property of the Contractor, who shall remove and legally dispose of same, away from the premises. Properly dispose of lighting fixture lamps and ballasts.

E. Work that has been cut or partially removed shall be protected against damage until covered by permanent construction.

F. Where equipment or fixtures are removed, wire shall be removed, outlets shall be properly blanked off, and conduits capped. After alterations are done, the entire installation shall present a "finished" look, as approved by the Architect and/or Engineer. The original function of the existing electrical work to be modified shall not be changed unless required by the specific revisions shown on the drawings.

G. The Contractor is required to maintain service by rerouting wiring for power and lights as necessary. Where walls and ceilings are to be removed as shown on the drawings, the conduit is to be cut off by the Electrical Trades so that the abandoned conduit in these walls and ceilings may be removed with the walls and ceilings by the Architectural Trades. All dead-end conduit runs shall be plugged at the remaining line outlet boxes or the panels.

H. Where new walls, ceilings, and/or floors are installed which interfere with existing outlets, devices, etc., which are to remain, the Electrical Trades shall adjust, extend and reconnect such items as required to maintain continuity of same.

I. Where devices on existing walls are no longer active, but wires feeding outlets are active, provide blank cover plates and box extensions are required to meet new finishes. Where devices and wires feeding them are no longer active, fill outlet boxes with plaster for finishing by others.

J. Where circuits, conduit, boxes, etc. are no longer used/in service they shall be entirely removed back to the panel (source of power).

K. Where shown as to use existing circuits and equipment in remodeled areas, the Contractor shall verify circuit identification, circuit loads, and as-build methods of installation to complete the demolition and new work in accordance with current codes.

L. Conceal all electrical work wherever possible. Use of surface raceway ("Wiremold") or exposed conduits will be permitted only where approved by the Architect and/or Engineer.

M. Existing lighting shall be reused where indicated on plans. Reused fixtures shall be cleaned with detergent, re-lamped and reconditioned for satisfactory operation and appearance.

3.18 WORK IN EXISTING BUILDINGS

A. The Owner will provide access to existing buildings as required. Access requirements to occupied buildings shall be identified on the project schedule. The Contractor, once work is started in the existing building, shall complete same work without interruption so as to return work areas as soon as possible to Owner.

B. Adequately protect and preserve all existing and newly installed work. The Contractor shall repair any damages that they are responsible for at their expense.

C. Consult with the Architect and/or Engineer as to the methods of carrying on the work so as not to interfere with the Owner's operation any more than absolutely necessary. Accordingly, all service lines shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the Architect, Engineer, and/or Owner's Representative.

3.19 FIELD QUALITY CONTROL

A. Equipment Start-Up

1. After completion of the installation, all systems and equipment shall be tested by the Contractor in the presence of the Owner's Representative and/or Engineer under actual operating conditions. Tests shall be performed according to manufacturer's recommendations.

2. The Contractor shall include with his bid the services of all required Equipment Manufacturer's field service technicians for a period necessary to complete the work to the satisfaction of the Engineer and Owner.

3. This service shall be for the purposes of check-out, initial start-up, certification, and instruction of plant personnel.

4. A written report covering the technician's findings and installation approval shall be submitted to the Engineer covering all inspections and outlining in detail any deficiencies noted.

5. Specific requirements, if any, for a particular system or piece of equipment are contained in the particular specification sections. The Contractor's responsibility relative to coordinating these services is contained in Section 01 7700, Closeout Procedures.

B. Manufacturer's Supervision and Field Installation Verification

1. Where specified, electrical equipment manufacturer shall furnish the services of an authorized representative especially trained and experienced in the installation of his equipment to

a. Supervise the equipment installation in accordance with the approved submittals and manufacturer's instructions.

b. Be present when the equipment is first put into operation.

c. Inspect, check, adjust as necessary, and approve the installation.

d. Repeat the inspection, checking, and adjusting until all trouble or defects are corrected and the equipment installation and operation are acceptable.

e. Prepare and submit the specified Manufacturers' Certified report. Include all costs for representative's services in the contract price.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CABLES (600 V AND LESS)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wire and cable for 600 volts and less.

B. Wiring connectors and connections.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

B. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.04 PROJECT CONDITIONS

A. Verify that field measurements are as shown on the Drawings.

B. Conductor sizes are based upon copper unless indicated as aluminum "AL" on the Drawings.

C. Wire and cable routing shown on the Drawings are 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.

1. Contractor shall coordinate all proposed routings through occupied areas with the Architect/Owner as required to determine acceptable appearance of new routings prior to rough-in.

PART 2 PRODUCTS

2.01 WIRING REQUIREMENTS

A. Concealed Dry Interior Locations: Use only building wire in conduit, or Metal Clad cable (where allowed by code).

B. Exposed Dry Interior Locations: Use only building wire in conduit building wire with Type THHN,THWN,XHHW insulation in conduit.

C. Above Accessible Ceilings: Use only building wire in conduit, or Metal Clad cable (where allowed by code).

D. Exterior Locations: Use only building wire with Type THWN or XHHW insulation in conduit.

E. Use stranded conductors for control circuits.

F. Use conductor not smaller than 10 AWG for power and lighting circuits.

G. Use conductor not smaller than 14 AWG for control circuits.

H. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

I. Use 8 AWG conductors for 30 ampere, 120 volt branch circuits longer than 75 feet.

J. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 125 feet.

K. Use 8 AWG conductors for 30 ampere, 277 volt branch circuits longer than 125 feet.

L. Conductor sizes are based on copper unless indicated as aluminum or "AL".

M. Cables for fire/smoke detection systems or for use in plenums without conduit shall be UL listed for plenum application, UL Style 1330, meeting ASTM D-2116 and ICEA color codes.

N. All feeders not sized on the plans shall be sized by the CONTRACTOR for a maximum of 2% voltage drop. All branch circuits shall be sized for a maximum of 3% voltage drop.

2.02 WIRE MANUFACTURERS

A. Cerro Wire Inc.: www.cerrowire.com.

B. Industrial Wire & Cable, Inc.: www.iewc.com.

C. Southwire Company: www.southwire.com.

D. Royal.

E. Rome.

F. General Cable.

G. Triangle.

2.03 BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor: Copper. Class B strand per ICEA S-61-402.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: NFPA 70.

1. For Feeders and Branch Circuits Equal to and Smaller Than 4/0 AWG (Dry and Damp locations): Type THHN rated 90 degrees C.
2. For Feeders and Branch Circuits Equal to and Smaller Than 4/0 AWG (Wet locations): Type THWN rated 90 degrees C.
3. For Feeders and Branch Circuits Larger Than 4/0 AWG (Dry and Damp locations): Type XHHW rated 90 degrees C.

E. Color Coding:

1. Branch circuits shall have their insulation color coded the entire length as noted below.
2. Feeder conductors shall have their ends taped, when entering junction boxes or panels, as noted below.
3. Color coding shall be as follows:
   a. 208/120 volt, 3 phase, 4 wire:
      1) grounded neutral - white
      2) phase A hot leg - black
      3) phase B hot leg - red
      4) phase C hot leg - blue
      5) ground - green
   b. 480/277 volt, 3 phase, 4 wire:
      1) grounded neutral - white with a color tracer
      2) phase A hot leg - brown

3) phase B hot leg - orange

4) phase C hot leg - yellow

5) ground - green with a color tracer

c. 480 volt, 3 phase, 3 wire:

1) phase A hot leg - brown

2) phase B hot leg - orange

3) phase C hot leg - yellow

4) ground - green with a color tracer

2.04 CONTROL WIRING

A. Control circuit, single conductor field wire shall be No. 14 AWG, stranded copper with 30 mil thick wall of cross linked polyethylene or polyvinyl chloride insulation rated to withstand a copper temperature of 90 degrees C. at 600 volts without deterioration. It shall meet applicable ICEA Standards.

B. Multi conductor control cable shall consist of individual conductors, No. 14 AWG, stranded copper with 30 mil thick wall of insulation rated to withstand a copper temperature of 75 degrees C without deterioration. The insulation shall be a 20 mil wall of polyethylene with a 10 mil thick polyvinyl chloride jacket. The individual conductors shall be identified per Paragraph 5.6.3. of ICEA Publication No. S 61402 and shall be cabled together with suitable fillers and binder tape to give the completed cable a substantially circular cross section.

2.05 METAL CLAD CABLE (TYPE MC CABLE)

A. Description: NFPA 70, Type MC.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 75 degrees C.

E. Insulation Material: Thermoplastic.

F. Armor Material: Steel.

G. Armor Design: Interlocked metal tape.

H. Fittings: Shall be specifically designed for use with type MC cable.

2.06 WIRING CONNECTORS

A. Split Bolt Connectors:

1. Manufacturers:

a. Black Burn.

b. T & B.

c. Burndy.

B. Solderless Pressure Connectors:

1. Manufacturers:

a. AMP.

b. T & B.

c. 3 M.

C. Spring Wire Connectors:

1. Manufacturers:
   a. Buchanah Model B-Cap.
   b. 3 M Model Scotchlok or Hyflex.
   c. Panduit Model P-Conn.

D. Compression Connectors:
1. Manufacturers:
   a. Neer.
   b. T & B.
   c. Appleton.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

D. Verify that field measurements are as indicated.

3.02 PREPARATION

A. Completely and thoroughly swab conduit/raceway before installing wire.

3.03 INSTALLATION

A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Route wire and cable as required to meet project conditions.
1. Wire and cable routing indicated is approximate unless dimensioned.
2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

C. Use wiring methods indicated.

D. All wiring shall be installed in conduit or approved raceway. All raceways shall be provided with a ground conductor unless noted otherwise.

E. Use stranded conductors for control circuits.

F. Pull all conductors into raceway at same time.

G. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

H. Protect exposed cable from damage.

I. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure. Do not rest cable on ceiling panels.

J. Use suitable cable fittings and connectors.

K. Neatly train and lace wiring inside boxes, equipment, and panelboards.

L. Clean conductor surfaces before installing lugs and connectors.

M. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

N. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape

uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

O. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

P. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

Q. Identify and color code wire and cable under provisions of Section 26 0553. Identify each conductor with its circuit number or other designation indicated.

R. Branch circuits may be combined up to 8 conductors (A-phase, B-phase, C-phase, neutral and A-phase, B-phase, C-phase, neutral) and 2 ground conductors in conduit. Contractor shall be responsible for derating conductors as required by N.E.C Article 310, Note 8.

S. Do not share neutral conductor on load side of dimmers.

T. Branch circuit neutral conductors: The use of multi-wire branch circuits with a common neutral is not permitted. Each branch circuit shall be furnished and installed with an accompanying neutral conductor sized the same as the phase conductor.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding components.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience with service facilities within 100 miles of Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. The Contractor shall be responsible for providing all grounding required in accordance with NEC and local code requirements. Grounding shown on the plans is minimum required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Power Systems: www.cooperpower.com.

B. American Electric.

C. Chance.

D. Burndy.

E. Cadweld.

2.02 GENERAL

A. The contractor shall install a grounding system in accordance with the drawings, specifications, and with the National Electrical Code, NEMA, USASI, and IEEE Standards, latest editions. The ground bar at the main service disconnect shall be bonded to the water mains, structural steel, driven ground rods, etc. by grounding electricode conductors as required for a code compliant grounding system. Maximum grounding resistance shall be achieved per NEC requirements.

2.03 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

1. Manufacturers: Chance, Burndy, American Electric - Blackburn.

B. Wire: Stranded copper.

C. Grounding Electrode Conductor: Size to meet NFPA 70 N.E.C. code requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Provide bonding to meet requirements described in Quality Assurance.

B. Provide isolated grounding conductor for circuits supplying personal computers, and isolated ground circuits as indicated on the drawings.

C. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

D. Where ground cables are installed in metallic conduit, the cables shall be bonded to the conduit at both ends of the run.

E. Welds on ground cables shall be cleaned and painted with an asphalt base paint where buried underground or imbedded in concrete.

F. Install a minimum #12 AWG green grounding wire for each branch circuit. The grounding wire shall be connected to the grounding terminal bus bars in panelboards, and these bars shall be grounded to the building's grounding system.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

B. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized. All structural supports and channels shall be manufactured from a minimum of #16 gauge ASTM A570 grade 33 steel.

C. Anchors and Fasteners:

1. Do not use spring clips.
2. Obtain permission from Architect/Structural ENGINEER before using powder-actuated anchors.
3. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.
4. Steel Structural Elements: Use beam clamps or welded fasteners.
5. Concrete Surfaces: Use expansion anchors.
6. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use hollow wall fasteners.
7. Solid Masonry Walls: Use expansion anchors or preset inserts.
8. Sheet Metal: Use sheet metal screws.

D. Formed Steel Channel:

1. Product: B-Line Strut.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.

1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
2. Obtain permission from Engineer before drilling or cutting structural members.

B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

C. Install surface-mounted cabinets and panelboards with minimum of four anchors.

D. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 26 0534

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit, fittings and conduit bodies.

1.02 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT).

C. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

D. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association.

E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.

F. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association.

G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association.

H. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches (51 mm) in diameter.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.06 PROJECT CONDITIONS

A. Verify that field measurements are as shown on the drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing shown on Drawings in approximate locations. Route as required to complete wiring system.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1. Contractor shall coordinate all proposed routings through occupied areas with the

Architect/Owner as required to determine acceptable appearance of new routings prior to rough-in

E. Coordinate painting requirements of exposed conduit in finished areas with specification section 09900 and color with Architect.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Conduit Size: Comply with NFPA 70.

1. Minimum Size: 3/4 inch (19 mm) where concealed within unaccessible construction (i.e. within walls, above drywall ceilings, etc.), 1/2" minimum elsewhere.

B. Underground Installations:

1. More than 5 Feet (1.5 Meters) from Foundation Wall: Use galvanized rigid steel conduit, thickwall nonmetallic conduit, or thinwall nonmetallic conduit.
2. Within 5 Feet (1.5 Meters) from Foundation Wall: Use galvanized rigid steel conduit, or thickwall nonmetallic conduit.
3. In or Under Slab on Grade: Use galvanized rigid steel conduit, or thickwall nonmetallic conduit.
4. Minimum Size: 1 inch (25 mm).

C. Outdoor Locations Above Grade: Use galvanized rigid steel conduit.

D. Wet and Damp Locations: Use galvanized rigid steel conduit.

E. Dry Locations:

1. Concealed: Use electrical metallic tubing.
2. Exposed: Use galvanized rigid steel conduit or electrical metallic tubing.

F. Transformer and Motor Connections:

1. Liquidtight flexible metal conduit (maximum length shall be 3'-0").

G. Lighting fixtures:

1. Interior: From junction box to lighting fixture shall be flexible metal conduit (maximum length shall be 6'-0").
2. Exterior: From junction box to lighting fixture shall be liquidtight flexible metal conduit (maximum length shall be 3'-0").

H. AC/MC Cable:

1. Use for concealed branch circuit drops to devices or light fixtures.
   a. Do not use AC/MC cable for homeruns to panelboards.

I. Control Wiring (fire alarm, clock/bell systems, A/V systems, security systems, temperature controls systems):

1. Use electrical metallic tubing, except when making final connection to moving equipment where flexible conduit or sealtite should be used.

2.02 METAL CONDUIT

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedtube.com.
2. Beck Manufacturing, Inc.: www.beckmfg.com.

3. Wheatland Tube Company: www.wheatland.com.
4. Century.

B. Rigid Steel Conduit: ANSI C80.1. Galvanized Rigid Steel (GRS).

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

1. Connectors and couplings shall be threaded, set-screw, or compression type, and concrete tight and/or rain tight where required.
2. Locknuts shall be malleable iron or steel. Bushings shall be malleable iron, steel, or plastic. Malleable iron or steel bushings shall be zinc or cadmium plated and shall have insulating insert of thermostatic plastic molded and locked into bushing ring. Plastic bushings shall be thermostatic phenolic insulating type. Use of non-rigid plastic bushings is prohibited.

2.03 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable Systems, Inc.: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.

B. Description: Interlocked steel construction.

C. Fittings: NEMA FB 1. cast fittings.

D. Flexible metal conduit shall have a separate grounding conductor.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable Systems, Inc.: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Anaconda Type "UA" for less than 1-1/4" and Type "EF" for larger than 1-1/2".

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: NEMA FB 1. cast fittings.

D. Flexible metal conduit shall have a separate grounding conductor.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedtube.com.
2. Beck Manufacturing, Inc.: www.beckmfg.com.
3. Wheatland Tube Company: www.wheatland.com.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron set screw type.

1. Connectors and couplings shall be threaded, set-screw, or compression type, and concrete tight and/or rain tight where required.
2. Locknuts shall be malleable iron or steel. Bushings shall be malleable iron, steel, or plastic. Malleable iron or steel bushings shall be zinc or cadmium plated and shall have insulating insert of thermostatic plastic molded and locked into bushing ring. Plastic bushings shall be thermostatic phenolic insulating type. Use of non-rigid plastic bushings is prohibited.

2.06 NONMETALLIC CONDUIT

A. Manufacturers:

1. AFC Cable Systems, Inc.: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. Carlon.

B. Description: NEMA TC 2; Schedule 40 = Thinwall; 80 = Thickwall PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify routing and termination locations of conduit prior to rough-in.

B. Conduit routing shown on drawings is approximate. Route as required to complete wiring system.

3.02 INSTALLATION

A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install steel conduit as specified in NECA 101.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 0529.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route exposed conduit parallel and perpendicular to walls.

K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

L. Route conduit in and under slab from point-to-point.

M. Maintain adequate clearance between conduit and piping.

N. Maintain 12 inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

O. Cut conduit square using saw or pipecutter; de-burr cut ends.

P. Bring conduit to shoulder of fittings; fasten securely.

Q. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch (50 mm) size. Elbows larger than 3" dia. shall be long radius elbows.

R. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

S. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.

T. Provide suitable pull string in each empty conduit except sleeves and nipples.

U. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

V. Ground and bond conduit under provisions of Section 26 0526.

W. Identify conduit under provisions of Section 26 0553.

X. Install insulating bushings at open ends of telephone, data, video, security, etc. conduits.

Y. Drawstrings shall be provided for all new empty conduits. Drawstring shall be wax impregnated, nylon, or other synthetic material resistant to moisture and mildew to prevent deterioration.

3.03 FIRESTOPPING

A. Use only firestop products that have been tested according to ASTM E-814 and UL 1479 for the conditions set forth regarding construction assembly type, penetrating item type, annular space requirements and fire rating.

B. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

1. For non-combustible penetrations including conduit not passing through a sleeve, the following materials are acceptable:
   a. Hilti FS 601 Elastmeric Firestop Sealant.
   b. 3 M.
   c. CSD Sealing Systems.
   d. Firestop Systems.
2. For non-combustible penetrations including sleeved conduits, the following materials are acceptable:
   a. Hilti FS 601 Elastmeric Firestop Sealant.
   b. 3 M.
   c. CSD Sealing Systems.
   d. Firestop Systems.
3. For combustible penetrations including cables and cable bundles, the following materials are acceptable:
   a. Hilti FS 611A Intumescent Firestop Sealant.
   b. 3 M.
   c. CSD Sealing Systems.
   d. Firestop Systems.

3.04 PAINTING

A. All conduit exposed in finished areas shall be painted to match the surrounding finishes. Refer to specification section 09900 - Coordinate color with Architect.

END OF SECTION

SECTION 26 0537

BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor Boxes.

C. Pull and junction boxes.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.

C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.

E. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

C. Pull boxes, junction boxes, and cable support boxes of proper size and design shall be provided in accordance with the N.E.C. and as required to facilitate installation of wires. All boxes shall be sized in accordance with the N.E.C. Covers shall be gasketed and held in place with corrosion resistant machine screws. Cable supports for vertical runs shall be provided at code required locations, within pull or junction boxes. Boxes shall be NEMA 12 for inside and NEMA 4 for outside use where exposed to the weather or where otherwise called for on the drawings.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.

B. Wall Plates for Finished Areas: As specified in Section 26 2726.

C. Outlet and switch boxes shall be minimum of 2-1/8" deep. When installed in a poured wall a 2-1/2" minimum deep box shall be used. When installed in masonry a 3-1/2" minimum deep box shall be used.

D. Use 2-gang 4" square boxes with single plaster rings for single device outlets.

2.02 FLOOR BOXES

A. Basis of Design: Wiremold “Resource RFB” series floor boxes: Model “RFB2” for above grade Floor Boxes / Model “RFB4-CI-1” for on-grade concrete floor Floor Boxes. OR equal from Hubbel, Thomas & Betts.

B. Floor Boxes: NEMA OS 1, fully adjustable, 3.5 inches deep.

C. Shape: Rectangular.

D. Service Fittings: As specified in Section 26 2726.

E. Conform to regulatory requirements for concrete-tight floor boxes

2.03 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 26 2716.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify locations of outlets & floor boxes in offices and work areas prior to rough-in.

B. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

3.02 INSTALLATION

A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

C. Coordinate installation of outlet boxes for equipment connected under Section 26 2717.

D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.

F. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

G. Maintain headroom and present neat mechanical appearance.

H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.

J. Provide identification labels on all junction boxes indicating what systems/equipment circuits are feeding (i.e. Lights in Room #102) and where they are being fed from (i.e. Panel LP-1)

K. Install boxes to preserve fire resistance rating of partitions and other elements.

L. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

M. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

N. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

O. Use flush mounting outlet box in finished areas.

P. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

Q. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls.

R. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

S. Use stamped steel bridges to fasten flush mounting outlet box between studs.

T. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

U. Use adjustable steel channel fasteners for hung ceiling outlet box.

V. Do not fasten boxes to ceiling support wires.

W. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches (305 mm) of box.

X. Use gang box where more than one device is mounted together. Do not use sectional box. Telephone/Data gang boxes shall be separate from power device gang boxes.

Y. Use 2-gang 4" square boxes with single plaster rings for single device outlets.

Z. Set Floor Boxes level.

AA. Large Pull Boxes (boxes larger than 100 cubic inches in volume or 12 inches in any dimension): Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.03 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

C. Adjust floor boxes flush with finish flooring material.

3.04 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

D. Panel schedules.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

C. Thomas & Betts.

D. Panduit.

2.02 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Locations:

1. Each electrical distribution and control equipment enclosure (including starters, disconnects, panelboards, breakers at distribution panels, etc.).

2. Communication cabinets.

C. Letter Size:

1. Use 1/2 inch letters for identifying equipment and loads. Identification shall indicate where the load is fed from.

2.03 WIRE MARKERS

A. Description: Vinyl cloth type self-adhesive wire markers.

B. Description: tape or split sleeve type wire markers.

C. Locations: Each conductor at panelboard gutters, pull boxes, and junction boxes each load connection.

1. Identify circuit feeder numbers at all wiring devices (receptacle, light switches, dimmers, etc.) with a self-adhesive wire marker taped to the back of the device cover plate.

D. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
2. Control Circuits: Control wire number indicated on shop drawings.

2.04 CONDUIT MARKERS

A. Description: Size: 1-1/8"x4-1/2" minimum. Color: Background color as specified below with black lettering.

B. Location: Furnish markers for each conduit longer than 6 feet (2 m).

C. Spacing: 20 feet (6 m) on center.

D. Color:

1. Fire Alarm System: Red.

E. Legend:

1. 480 Volt System: 480 Volt.
2. 277 Volt System: 277 Volt.
3. 240 Volt System: 240 Volt.
4. 208 Volt System: 208 Volt.
5. Fire Alarm System: Fire Alarm.

2.05 PANEL SCHEDULES

A. Each panel shall have a typewritten panel schedule indicating loads. A clear plastic cover over the schedule shall be provided to protect it.

B. Existing panel schedules shall be improved to indicate all existing loads and/or updated to indicate all changes that have occurred during renovation. Typing over writing over existing entries on existing schedules is not acceptable. A new schedule shall be provided. Entries must be in type written form.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

A. Install nameplates and labels parallel to equipment lines.

B. Secure nameplates to equipment front using screws or rivets.

C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.

D. Identify all boxes for fire alarm circuits by painting cover plates red.

END OF SECTION

SECTION 26 0923

LIGHTING CONTROL DEVICES - WIRED

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NFPA 70 - National Electrical Code; National Fire Protection Association.

D. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
4. Notify ENGINEER of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.04 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

B. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

C. Operation and Maintenance Data: Include detailed information on device programming and setup.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.06 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after

installation.

PART 2 PRODUCTS

2.01 ALL LIGHTING CONTROL DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. Manufacturers:

1. Hubbell Building Automation, Inc.: www.hubbellautomation.com
2. WattStopper: www.wattstopper.com.
3. Leviton.
4. Cooper.
5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
   b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, up to a maximum time delay setting of not less than 15 minutes and not more than 30 minutes.
8. Sensitivity: Field adjustable.

9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
11. Compatibility: Suitable for controlling LED lighting, incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on the drawings.
13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.

C. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:
   a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
   b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
   c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
   d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
   e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
   f. Provide selectable audible alert to notify occupant of impending load turn-off.
   g. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
   h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.
2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq. m).
3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet (37.2 sq. m).
4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq. m).

D. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:
   a. Description: Low profile occupancy sensors designed for ceiling installation.
   b. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
   c. Provide field selectable setting for disabling LED motion detector visual indicator.
   d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.

e. Finish: White unless otherwise indicated.

2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 square meters) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

3. Ultrasonic Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet (46.5 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet (92.9 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet (185.8 sq. m) at a mounting height of 9 feet (2.7 m).

4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq. m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq. m) at a mounting height of 9 feet (2.7 m).

E. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.

2. Provide HVAC relay contact in all Occupancy Sensors and/or Power Packs for use by HVAC Temperature Controls (T.C.).

3. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.

4. Input Supply Voltage: Dual rated for 120/277 V ac.

5. Load Rating: As required to control the load indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated

B. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of lighting control devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify ENGINEER to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.

G. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

H. Install identification label for wall switch occupancy sensors, and accessory manual wall switches in accordance with Section 26 0526 indicating load served where indicated, when controlling loads that are not visible from the control location, or when multiple control devices are installed at one location.

I. Occupancy Sensor Locations:

1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a

minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

J. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

K. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

A. Inspect each lighting control device for damage and defects.

B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

C. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by ENGINEER.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule. Record settings in written report to be included with submittals.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Refer to Division 1.

B. Demonstration: Demonstrate proper operation of lighting control devices to ENGINEER, and correct deficiencies or make adjustments as directed.

C. Training: Train OWNER's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
4. Location: At project site.

END OF SECTION

SECTION 26 0943

LIGHTING CONTROLS – WAVELINX (PRO / Wireless)

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wireless Lighting Control Devices
2. System Software Interfaces
3. System Backbone and Integration Equipment

B. Related Sections:

1. Section 260010 – Supplemental Requirements for Electrical – for abbreviations, definitions, submittals, qualifications, testing agencies and other requirements applicable to work specified in this Section.
2. Section 262726 - Wiring Devices/Lighting Controls for wired switches, dimmers and receptacles requirement applicable to work specified in this section.

1.2 DEFINITIONS

A. Communication Bus: A wired interface a device uses to communicate with other control devices.

B. Device: A wireless equipment that controls the light emitted by a lighting source, including fluorescent ballasts, LED drivers, incandescent lamps, manual switches, switching relays, dimming modules and sensors.

C. Group: A set of devices that communicate together

D. Scene: Digital light level associated with a preset

E. Supervisory System: A set of tools to acquire, process, communicate and display equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

F. System Backbone: Devices used to connect separate spaces via TCP/IP, including bridging devices, gateways, and area controllers.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Midland County Services Building (MCSB).

B. Pre-installation Coordination Meeting(s): For networked systems, conduct meeting(s) via videoconference or in person at the project site before construction activities.

1. Attendees: Installers, fabricators, representatives of manufacturers, and administrators for field tests and inspections. Notify the architect, construction manager and owner's commissioning authority of scheduled meeting dates.
2. Scope: Review the submittal drawing, sequence of operation, IT requirements, and wiring best practices, including wiring testing, device installation best practices and lighting control integration requirements with other systems with the project team.

1.4 ACTION SUBMITTALS

A. Product data:

1. Bill of Materials necessary to install the networked lighting control system.

2. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
3. Information Technology (IT) connection information pertaining to interconnection with facility IT networking equipment and third-party systems.
4. General and system notes define system characteristics the installer should know before installing.
5. Other diagrams and operational descriptions as needed to indicate system operation or interaction with other system(s).

B. Shop drawings:

1. Riser diagram showing device wiring or wireless connections and typical per room/area type.
2. IT system drawing showing how IP devices are connected (especially for higher-level networking devices).

C. The sequence of operation:

1. Description of how each component operates and how any building-wide functionality is achieved to meet/exceed then current local energy code (Michigan, ASHRAE 90.1).

D. Commissioning forms:

1. Forms are to be completed by the installer before requesting the system start-up.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor Start-up/Commissioning Worksheet.

B. Service Specification Sheets indicating general service descriptions, including start-up, training, post-startup support, and service contract terms.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Contracts.

B. Hardware and Software Operation Manuals

C. Maintenance service agreement.

D. Warranty documentation.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications

B. Phone Support: Toll-free technical support shall be available from the manufacturer through an online tool to schedule a technical support appointment and provide 24/7 emergency support.

C. Remote Support: The manufacturer shall be able to provide remote support and virtually connect with customers to address issues with visual guidance overlaid on images of real-world objects.

D. On-Site Support: The manufacturer shall be capable of providing a 72-hour, on-site response time within the continental United States.

E. Service Contracts: The manufacturer shall be capable of providing service contracts for continued on-site and remote support of the lighting control system post-installation for terms up to 10 years from substantial completion, including:

F. Remote and on-site emergency response.

G. Remote system performance checks.

H. Remote diagnostics.

I. Replacement parts.

1.8 WARRANTY

A. Warranty: The manufacturer and Installer warrant that installed lighting control devices perform per specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within the extended warranty period.

B. Failures include, but are not limited to, the following:

1. Faulty operation of lighting control hardware.
2. Faulty operation of lighting control firmware.

C. Minium Warranty Period

D. Five years for lighting control devices from the date of shipment.

E. One year for the supervisory controller from the date of shipment

F. One year for lighting management software application from the date of shipment

G. Recommended spare parts:

1. Ceiling sensors: one (1) spare for every 200 installed to be used for maintenance.
2. Wallstations: one (1) spare for every 200 installed for maintenance.
3. Receptacle: one (1) spare for every 100 installed for maintenance.
4. Relay Switchpack: one (1) spare for every 200 installed for maintenance.
5. Area Controller: one (1) spare for every 100 installed for maintenance.
6. Touchscreens: one (1) spare for every 50 installed for maintenance.

PART 2 - PRODUCTS

2.1 SYSTEM COMPLIANCE

A. Components manufactured in accordance with UL 916 and UL 924 standards where applicable.

B. Components manufactured in accordance with CFR Title 47, Part 15 standards where applicable.

C. Components manufactured in accordance with ISED Canada RSS-247 standards where applicable.

D. Components manufactured in accordance with IFT-008-2015 and NOM-208-SCFI-2016 standards where applicable.

E. The system shall be listed as a qualified system under Design Lights Consortium Networked Lighting Control System Specification v5.0.

F. Performance Criteria:

G. Listed and labelled in accordance with NFPA 70 by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2 SYSTEM PERFORMANCE REQUIREMENTS

A. System Characteristics

1. The system is composed of the following interconnected digital control devices:
    a. Wallstations
    b. Occupancy/Vacancy Ceiling and tile mount Sensors.
    c. Fixture mount sensors for indoor fixtures
    d. Dimming Switchpack
    e. Dimming emergency switchpack
    f. Contact Closure Input
    g. Area controller for networked spaces.
    h. Area hub to network multiple control areas to an area controller.
    i. Supervisory server.
    j. Lighting Management Software applications
    k. BACnet/IP, API, OpenADR and Shades interfaces.
2. The system shall be able to support the following topologies:
    a. Interconnected digital control devices to control the lights in a standalone room/a space with one or multiple zones.
    b. Interconnected digital control devices, area hubs and area controllers to control the lights in networked rooms/spaces with one or multiple zones per room.
    c. Hybrid lighting control with the integration devices like area hubs and area controllers to control wireless lights, including connected luminaires seamlessly. The wireless system should be able to control the wired system as well.
3. In a single room/space topology, the lighting control system shall provide the following capabilities:
    a. Wireless communication – The devices shall be able to exchange data with each other wireless communication.
    b. Occupancy sensing – The ability to automatically turn the lights on and off based upon detecting the presence or absence of people in an indoor or outdoor space.
    c. Daylight harvesting - The capability of automatically affecting the operation of luminaires based on the amount of daylight present in a space.
    d. Zoning - The capability of grouping luminaires to form unique lighting control zones for a control strategy via software or electrical installation details (e.g. wiring).
    e. High-end trim - The ability to set the maximum light output to a less-than-maximum state of an individual or group of luminaires/lamps using the software application.
    f. Individual Addressability - The ability to uniquely identify and address each control device, allowing for configuration and re-configuration of devices and control zones independent of electrical circuiting.
    g. Continuous dimming – The ability to offer smooth light level changes by providing high resolution in light output control.
    h. Personal Control – The capability for individual users to adjust the lights to their personal preferences using a control interface.
    i. Scenes control – The capability of providing two or more pre-programmed light level settings for a group or multiple groups of luminaires.
    j. Zone control – The capability of controlling a zone based on the last affected zone or last active scene that was controlled by a control device like a Wallstation.
    k. Emergency lighting – The capability of having emergency lighting to full on upon loss of normal power.
    l. Luminaire Level Lighting Control (connected luminaires) - The capability to have an occupancy sensor and ambient light sensor installed for each luminaire for luminaire level control as well as the ability of individual luminaires to exchange data with other luminaires and control devices on the system (Note: for wireless luminaires and control devices only).
    m. Programming – The capability of allowing installers and system owners to configure the system to meet their specifications using an application running on a mobile device.

n. System devices support firmware updates from a mobile app or controller.
o. Out-of-box zone control – The ability to order various digital control devices like wallstations and dimming swithpacks pre-configured with a zone number from the manufacturer allowing for out-of-box zone control of the space with no programming.
p. Standalone Control – The capability for digital lighting control devices within the same space to provide automatic control from sensors (occupancy and/or photosensor) without requiring connection to a higher-level system component.
q. Contact Closure Inputs – The capability of the wireless system to react to the input from an Alarm, Demand response, KeySwitch/Master switch, timeclock without requiring connection to a higher-level system component.

4. In a networked rooms/spaces topology, the system shall provide the following capabilities in addition to the capabilities available in a single room/space application:

a. 7-Days / Astronomic scheduling – The ability to automatically affect the operation of lighting equipment based on the time of day. The system shall offer time-based scheduling and "astronomical" scheduling functionality for sunrise and sunset programming based on geographical location and time of year.
b. Demand Response (Load Shedding) - The capability to temporarily reduce the energy consumption of a lighting system, in a pre-defined way, in response to a demand response signal without manual intervention.
c. OpenADR – The capability to receive demand response commands from a utility company using the OpenADR standard.
d. Floorplan – The capability to manage the lighting system via a floorplan, i.e., change the light of a single fixture or group of fixtures from the floorplan and view the health status of a fixture or a group of fixtures.
e. Programming – The capability of programming and managing all spaces from a mobile app running on a mobile device and a web browser accessing a computing device. The supervisory server, area controller, and area hub serve the web pages.
f. Energy reporting – The capability to report energy consumption (calculated or measured) of a connected luminaire or a group of luminaires for up to 13 months.
g. Occupancy reporting – The capability to report occupancy usage of areas for up to 13 months.
h. Integration with third-party systems via BACnet/IP and Public (REST) API
i. Firmware update – The capability to update the firmware of multiple area controllers
j. System health monitoring - The ability to monitor, diagnose, and report operational performance, including system and/or component failures.

B. Wireless Control System Characteristics

1. Multiple wireless networking protocols supported:

a. A 2.4 GHz IEEE 02.15.1 Bluetooth Sig Mesh network is used when the system is deployed in a standalone topology. The devices use this protocol to communicate directly with each other and with the mobile device used to program the system.
b. A 2.4 GHz IEEE 802.15.4 wireless mesh network is used when the system is deployed in a networked topology. The devices use this protocol to communicate with each other and an area controller.
c. A 2.4 GHz Wi-Fi IEEE 802.11 b/g/n protocol is used when the system is deployed in a networked topology. The area controller uses this protocol to communicate with the mobile device used to program the system.

2. No wired connections shall be required between networked control. Wired connections shall only be required to connect area controllers, supervisory controllers, and Touchscreen. The wired connection is used to allow for central management of the system.
3. The wireless mesh network shall self-configure, self-organize and self-heal.

4. Wireless network communication must support uniform and instant response such that all luminaires in a lighting control zone respond immediately and synchronously in response to a sensor or wall station signal.
5. The wireless lighting control system shall provide a visible indication on all wireless devices as each wireless device joins the wireless network.
6. Wireless devices shall have a line-of-sight communication range of 150 ft and 75 ft under typical site conditions accounting for typical environment conditions and building construction materials.
7. The wireless lighting control system shall allow addressed wireless light fixtures with integrated sensors to be identified (reverse-identified) by the sensor with laser, flashlight, IR remote, etc. Identified light fixtures shall provide a visible indication on the mobile application. Systems that do not permit reverse identification methods shall not be acceptable.
8. The wireless lighting control system shall allow wireless wallstations, wireless Switchpack with 0-10V dimming and battery-powered wireless sensors to be identified (reverse-identified) by a simple pushbutton method on each device. Identified devices shall provide visible indications on the mobile application. Systems that do not permit reverse identification methods shall not be acceptable.
9. The wireless lighting control system shall support standalone and networked topologies. The WaveLinx Area Controllers shall not be connected to an IP network in a standalone topology. The user shall program the standalone area controller via a mobile app. In a networked topology, the WaveLinx Area Controllers are connected to an IP network and bi-directionally communicate with a supervisory system.

C. System Integration Capabilities

1. The system shall provide the necessary interfaces to integrate with third-party systems such as building management systems (BMS) and smart building platforms.
2. The system shall offer the following interfaces:
    a. BACnet/IP protocol to integrate with the building automation system and other BACnet/IP supporting systems.
    b. RESTful API includes the following system integration capabilities:
        1) "Write" messages to control individual devices, including relay and dimming output.
        2) "Write" messages to control groups of devices through a single command, including control of relay and dimming output of all devices.
        3) "Read" messages for individual device status information. The available status will vary based on device type and capabilities, including relay state, dimming output, power measurement, occupancy sensor status, and photosensor light measurement.
        4) "Read" messages for group status information for occupancy, relay state, and dimming output.
    c. OpenADR 2.0b to active demand response requests from utility companies' Demand Response Automation Servers (DRAS).

D. Supported Sequence of Operations

1. Control Zones
    a. Standalone topology: A group of lighting control devices (ceiling sensor, wallstations, Switchpacks) installed in a single area that communicate with each other and adjust the lights within the space based on the space’s occupancy status, daylight levels coming into the room as well as occupants’ actions. The lights can be grouped together up to 16 unique control zones to support different and reconfigurable sequences of operation within the area.
    b. Networked topology: A group of connected luminaires and lighting control devices (ceiling sensors, wallstations, swithpacks), including a hybrid topology, installed in different areas that communicate to an area controller. The devices communicate

with each and adjust the lights within the space based on the space's occupancy status, daylight levels coming into the rooms as well as occupants' actions. The lights can be grouped together up to 30 control zones per area and up to 49 areas to support different and reconfigurable sequences of operation within those areas.

2. Wallstation Capabilities
    a. Wall stations support the following capabilities:
        1) On/Off control of one or many zones.
        2) Continuous dimming control of the light level of one or many zones.
        3) Multi-Way Control: Multiple wallstations capable of controlling the same zones to support "multi-way" switching and dimming control
        4) Minimum actions supported: Specific light level, specific scene, raise, lower, toggle (available in networked topology only)
3. Occupancy Sensing Capabilities
    a. Occupancy sensors configurable to control one or multiple zones.
    b. Multiple occupancy sensors controlling one or multiple zones.
    c. Occupancy sensing sequence of operation modes:
        1) On/Off Occupancy Sensing.
        2) Partial-On Occupancy Sensing.
        3) Partial-Off Occupancy Sensing.
        4) Vacancy Sensing (Manual-On / Automatic-Off).
    d. On/Off, Partial-On, and Partial-Off Occupancy Sensing Modes Sequence of Operation:
        1) When occupancy is detected, occupancy automatically turns lights on to a designated level or scene (0 to 100%).
        2) Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when a vacancy occurs or if sufficient daylight is detected.
        3) A system capable of combining Partial-Off and Full-Off operations by dimming lights to a designated level when vacant and turning the lights off entirely after an additional time delay.
        4) If enabled in the occupancy sensing control zone, photosensor readings automatically adjust light levels during occupied or unoccupied conditions as necessary.
        5) Wall station activation changes the dimming level or turns the lights off as the occupant selects. Lights optionally remain in this manually specified light level until the zone becomes vacant. Upon vacancy, the normal sequence of operation resumes.
    e. Vacancy Sensing or Manual-On/Automatic-Off Mode Sequence of Operation:
        1) Activation of a wall station is required to turn lights on. A system capable of programming the area to turn on to a designated light level. Initially occupying the space without using a wall station must not result in lights turning on.
        2) Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when a vacancy occurs or if sufficient daylight is detected. Users can change the default unoccupied light level (0%) to another light level.
        3) Photosensor readings, if enabled in the Occupancy Sensing control set, can automatically adjust the light level during occupied or unoccupied conditions as necessary.
        4) Wall station interaction changes the dimming level or turns lights off as the occupant selects. Lights remain at the manually specified light level until the zone becomes vacant; the normal sequence of operation resumes upon vacancy.
    f. Occupancy time delays before dimming or shutting off lights separately programmable for all control zones from 15 seconds to 2 hours.
    g. Energy mode sequence of operation:

1) The system shall be capable of dimming the lights when vacant and then turning the lights off entirely after an additional time delay.
2) Associated occupancy sets: Networked control devices can track occupancy broadcasts from adjacent zones. When this feature is enabled, luminaire output for a vacant zone will reduce to a configurable dimmed state if one or more adjacent zones are occupied. Luminaires will turn off when both primary and adjacent zones are vacant.

4. Daylighting Sensing Capabilities

a. Photosensor devices configurable to control a local zone.
b. Photosensor-Based Control: The photosensor will automatically adjusts dimming output in response to photometric readings, to maintain a minimum light level consisting of both electric light and daylight sources. Photosensor response can be adjusted using the programming application.

5. Time-based Events Capabilities in networked operation

a. The system shall be able to trigger actions at user-defined time.
b. The following actions can be defined with a time-based event:
1) Enable/Disable Wallstations
2) Select Occupancy Actions
3) Select Scene for one or multiple areas/zones.
4) Set White Tuning Level for one or multiple areas/zones.
5) Set Zone Level for one or multiple zones.
6) Enable/Disable Occupancy Detection
7) Enable/Disable Manual Timer
c. The system shall allow user to define recurring actions. The user can define daily, weekly, yearly and a specific date. The system shall support definition of start date, end date, end after "n" recurrences, or never ending.
d. The system shall be able to allow users to schedule events based on sunrise and sunset. The Sunrise/sunset times automatically derived from location of the building using an astronomical clock. The system shall be able to support buildings located in different geographies. The system shall also allow the definition of timed offsets relative to sunrise or sunset.
e. The lighting management software application shall offer a graphical calendar view of scheduled event. profile schedules for each control zone. The system shall support daily, weekly and monthly calendar views.

6. General Characteristics

a. System capable of providing a visible "blink warning" prior to a light turning off if required by the sequence of operations.

2.3 SYSTEM SOFTWARE INTERFACES

A. The system shall allow users to program and manage the system via a mobile app and/or latest web browser from Apple, Googe and Microsoft.

B. Programming

1. The system shall support the following features:

b. Programming via an auxiliary device or via an interface already embedded in all or certain control devices. Once programming is done the auxiliary programming device may be removed and the control devices should remember its programming. Similarly when the auxiliary device is connected to the programmed wired system, it should be able read in the systems configured/programmed parameters.
c. Creating, editing and deleting the building elements, i.e. building, floor, areas and zones, occupancy groups and daylight groups.
d. Discovery of the control devices.

e. Blink identification of control devices, by blinking them or devices connected to them.
f. Ability to add one or many devices to a defined area.
g. Switch, occupancy sensor, and photosensor zone configuration.
h. Defining high- and low-end trim levels
i. Ability to adjust an occupancy sensor hold time and PIR sensitivity.
j. Ability to define the sensor occupancy mode (occupancy or vacancy)
k. Ability to enable or disable an occupancy sensor or group of occupancy sensors.
l. Ability to enable/disable a daylight sensor or group of daylight sensors
m. Ability to adjust the photocell setpoints and transition time delays.
n. Ability to calibrate the photocell and auto-setpoint.
o. Defining the Demand Response values for each area.
p. Definition of scene values for each area.
q. Definition of time-based events to turn the lights on/off for one or many areas.
r. The system shall display live status of control devices and connected luminaires:
    8) Luminaire on/off status.
    9) Dim level.
    10) Occupancy sensor status.
    11) Photosensor reading.
    12) Device health status
s. The system shall allow users to easily identify the devices using its attributes:
    1) Device Type
    2) Device Description
    3) Model description.
    4) Serial number or network ID.
    5) Device Name that can be edited

C. Lighting Management

1. The system shall allow users to monitor and control the lights:

a. Area lights can be monitored for on/off status.
b. Area lights can be modified to a pre-defined scene or defined light level.
c. Zone lights can be monitored for on/off status.
d. Zone lights can be modified to define the light level.
e. Individual control devices can be monitored for on/off status.
f. Individual control devices can be modified to define light levels or on/off status.

2. When higher level network devices are used, the system shall offer a graphical floorplan:

a. The user shall be to create a floorplan for each floor within the building with areas, zones and devices. No additional services from manufacturers are required to create and manage the floorplan.
b. The floorplan shall offer the following features:
    1) Pan and zoom commands supported to allow smaller areas to be displayed on a larger scale simply by panning and zooming each floor's master graphic.
    2) When selecting an area/zone or a device from the floorplan shall, the system shall display a property display that would allow users to monitor the selected element and perform specific actions:
        a) Element Name.
        b) Total Alarms
        c) Current light level (scene or light level)
        d) Manual Actions including manual override.
        e) Device diagnostic information.

D. Alarms/Events Management

1. The system shall display the system's fault in near real-time. System faults include loss of communication and low battery alarms for battery powered devices (wireless wallstations and wireless ceiling sensors).
2. When higher level network interfaces are used, such as the Area Hub and area controller:
3. The system shall allow users to view current and past system faults to provide better insight into the system's health.
4. The system shall offer context-sensitive troubleshooting tips for each alarm.
5. The system shall offer a floorplan locator for each alarm. When selected, the system shall automatically launch the floorplan and zoom in on the selected device.
6. The system shall send e-mail notifications to subscribe users for each fault. The user shall provide the SMTP server information to allow the supervisory software application to send out e-mail notifications.

E. User Management

1. The system shall include user management module allowing users to:

   a. Create user accounts.
   b. Assign the user account to a specific role.
   c. Create custom roles based on pre-determined permissions.
   d. Restrict access for user accounts to specific areas within the system.

F. System Energy Analysis and Reporting

1. When higher-level network devices are used, such as an Area Hub and Area Controller:

   a. The system shall offer an intuitive graphical interface allowing the building owner to view the energy usage for the buildings controlled by the system.
   b. The interface shall allow users to analyze the data based on the building hierarchy, i.e. building, floors, areas and zones, as well as the source type, i.e. lighting.
   c. The system shall collect energy usage data for 13 consecutive months.
   d. The system shall allow users to select the period for the energy usage, i.e. last 24 hours, last 7 days, last 30 days, last 3 months, last 12 months.
   e. The system shall provide the energy savings generated by the lighting system in kWh for the selected period.
   f. The system shall allow users to export the report as a pdf or an excel.

2.4 CYBERSECURITY

A. The IP network connectable products within the networked, wireless, and hybrid Lighting Control system can comply with the IEC 62443-4-2 cybersecurity standard. A letter of compliance by an IEC authorized certification lab shall be provided for all IP connectable products. Self-certification to the standard will not be accepted.

B. All wireless communication between lighting control components supports the following five tiers of security measures:

1. Data encryption.
2. Firmware protection.
3. Tamper-proof hardware.
4. Authenticated user access.
5. Mutual device authentication

C. Wireless devices use AES encryption to secure communication with a unique encryption key generated for each programmed site.

D. Wireless devices use signed firmware to ensure that unmodified, authentic software is always installed.

2.5 WIRELESS DEVICES

A. Wireless Dimming Switchpack

1. Basis-of-design Product: WaveLinx PRO Universal Dimming Switchpack with one 0-10V Dimming channel [RSP-P-010-347] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. Communication: Wireless IEEE 802.15.4
3. Plenum-rated
4. Integrated, self-contained unit consisting internally of an isolated load switching control relay [and a power supply to provide low-voltage power].
5. Input Voltage: 120/277/347 VAC
6. Relay Output:
7. 20amp 120/277/347VAC General Purpose
8. 16amp 120/277/347VAC electronic ballast (LED load)
9. Dimming Output: Single Class 2 0-10V dimming output
10. Sink Current: 120mA at 0-10 VDC.
11. Mounting: Integral 1/2 inch chase nipple.
12. Calculated energy consumption data available through the WaveLinx CORE
13. Shall be compatible with electronic ballast, LED, incandescent, magnetic, or electronic low-voltage, magnetic or electronic fluorescent, and motor loads.
14. Shall be capable of controlling up to 20-amp receptacle or plug loads.
15. Controls incorporate non-volatile memory. Settings and parameters saved in protected memory shall not be lost should power be interrupted and restored.
16. Environmental regulations:
    a. FCC certified.

B. Wireless Dimming Switchpack with Dry Contact Closure

1. Basis-of-design Product: WaveLinx PRO Universal Dimming Switchpack with Dry Contact Closure [WSP-CA-010] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. Communication: Wireless IEEE 802.15.4
3. Plenum-rated
4. Integrated, self-contained unit consisting internally of an isolated load switching control relay [and a power supply to provide low-voltage power].
5. Relay Output:
    a. 20amp 347VAC General Purpose
    b. 16amp 347VAC electronic ballast (LED load)
6. Dimming Output: Single Class 2 0-10V dimming output
7. Sink Current: 30mA at 0-10 VDC.
8. Contact Closure Input: 1 input interface to support wired low-voltage sensor or maintained contact closure signal.
9. Mounting: Integral 1/2 in chase nipple
10. Calculated energy consumption data based on maximum connected power available through the WaveLinx CORE
11. Shall be compatible with electronic ballast, LED, incandescent, magnetic, or electronic low-voltage, magnetic or electronic fluorescent, and motor loads.
12. Shall be capable of controlling up to 20Amp receptacle or plug loads.
13. Controls incorporate non-volatile memory. Settings and parameters saved in protected memory shall not be lost should power be interrupted and restored.
14. Standards/Environmental regulations:
    a. FCC certified.

b. cULus Listed.
c. RoHS

C. Wireless Ceiling Occupancy Sensor

1. Basis-of-design Product: WaveLinx PRO Ceiling Occupancy Sensor [CWPD-1500] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. Communication: Wireless IEEE 802.15.4
3. Input power: Two (2) AA standard alkaline batteries.
4. Sensing technologies:
5. Motion sensing:
    a. PIR multiple-segmented lens, with internal grooves to eliminate dust and residue build-up.
    b. Products tested in identical manner, compliant with NEMA WD 7 -2011 Occupancy Motion Sensors Standards
    c. Sensor shall have time delays from 10 to 20 min.
    d. Sensor battery life shall be ten years based on approximately 30 daily activations and wireless signals.
6. Daylight Sensing:
    a. Open-loop daylight sensor
    b. 0-1000lux
    c. Light input within 60° cone
7. Power failure memory: Device shall incorporate non-volatile memory. Settings and parameters saved in protected memory shall not be lost should power be interrupted and subsequently restored. Programming is stored in each sensor in addition to the Area Controller.
8. Sensor reports the following data to the area controller:
    a. Battery life
    b. Occupancy status
    c. Ambient light level
9. LED indicators: LED indicators always provides a visual means to verify that motion is being detected during both testing and normal operation.
10. Sensors shall be fully adaptive with the ability to have the sensitivity and timing to be remotely adjusted to ensure optimal lighting control for any use of the space.
11. Sensors have remotely adjustable settings for dimming levels, occupied/unoccupied light levels, occupancy/vacancy sensing, and sensitivity to changes in motion and changes in ambient light levels.
12. Sensors may remotely adjust the light output to reduced levels and remain at that reduced level for an adjustable period before turning off when the space is unoccupied.
13. Standards/Environmental regulations:
    a. FCC certified.
    b. cULus Listed
    c. RoHS

D. Wireless Tile Mount Sensor

1. Basis-of-design Product: WaveLinx PRO Tilemount Sensor Kit [WTA] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand

2. Sensing mechanism:
    a. [Infrared]: Utilize multiple-segmented lens with internal grooves to eliminate dust and residue build-up.
    b. Daylight]: Utilize integrated daylight sensor to provide closed-loop daylight dimming control. Each WaveLinx PRO Integrated Sensor provides an individual daylight dimming zone to provide highly accurate daylight levels at the work surface throughout the entire space.
    c. Location]: Utilize additional internal Bluetooth radio capable of offering Real-Time Location Services (RTLS) – IoT Software Upgrade Required
3. Power failure memory:
    a. Controls incorporate non-volatile memory. Settings and parameters saved in protected memory shall not be lost should power be interrupted and subsequently restored.
4. Tilemount sensor connects to a control module which supports up to 3 amps of connected fixtures.
5. Tilemount is designed to be installed in a ½" or ¾" ceiling tile within 54" (137cm) of the control modules and connected fixtures.
6. Sensor shall provide unique daylight calibration considering the light level at the sensors, work surface and integrated luminaire light output.
7. All sensors shall provide an LED as a visual means of indication and diagnostics.
8. Control Module:
    a. Sensor shall connect to a 0-10V dimmable ballast or driver via a control module or connect to a WaveLinx enabled driver without using the WaveLinx control module.
    b. The sensor shall connect to a controller via a low-voltage cable for interior applications.
    c. If power dropouts in the event of a brown-out or black-out, when power is restored, the lighting system should recover quickly and automatically return to the last lighting levels. A momentary interruption (1 or 2 seconds) of power should not cause extended periods (20 seconds or more) without lighting while the system reboots and all other electrical equipment is back on.
    d. The luminaire manufacturer shall install the Control Module within the luminaire before shipping it.
9. The sensor shall be a Class 2 device.
10. The system shall support user-initiated manual demand response and utility, or BMS initiated automatic demand response.
11. Standards/Environmental regulations:
    a. FCC certified
    b. cULus Listed
    c. RoHS

E. Wireless Personal Control Interfaces

1. Basis-of-design Product: WaveLinx PRO Line-Voltage Wallstation [W-Series], [WW-Series] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. Communication: Wireless IEEE 802.15.4
3. Input power: 120-1277VAC
4. Shall provide individual button LED indication of status and wireless communication and selected button.
5. Controls incorporate non-volatile memory. Settings and parameters saved in protected memory shall not be lost should power be interrupted and restored.

6. WaveLinx PRO Line-Voltage Wallstation shall be a Class 1 device.
7. Wireless momentary pushbutton switches in 1, 2, 3, 4, 5 and 6 button configurations; available in white, ivory (W-series only), grey (W-series only) and black (W-series only); compatible with wall plates with decorator opening. WaveLinx PRO Line-Voltage Wallstations shall include the following features:
    a. Multi-level scene selection
    b. Scene raise/lower
    c. Toggle ON/OFF
    d. Removable buttons for field replacement with engraved buttons and/or alternate color buttons [ENGRV-*BTNL-*], [ENGRV-*BTNS-*]. Button replacement may be completed without removing the switch from the wall.
    e. Intuitive button labelling to match application and load controls.
    f. Pre-defined digital button configurations. Each wallstation is shipped with pre-defined digital button configurations, automatically mapped to specific area/zone controls when added to an area in the WaveLinx Mobile Application.
8. Multiple WaveLinx PRO wallstations may be installed in an area by simply connecting them to the WaveLinx PRO network. No additional configuration will be required to achieve multi-way switching.
9. WaveLinx PRO Line-Voltage Wallstations are delivered with pre-defined functions, including raise, lower, Half Lights, Full Lights, Read, Relax, Dimmed, Night, manual and scene control.
10. WaveLinx PRO Line-Voltage Wallstations may also be delivered with field-programmable generic labelled buttons such as Scene 1, Scene 2, etc.
11. Optional custom labelling is available for application or location-specific wallstation button labels.
12. Environmental regulations:
    a. FCC certified.

F. Wireless Battery Powered Wallstation [WB-Series], [WWB-Series]

1. Basis-of-design Product: WaveLinx PRO Battery Powered Wallstation [WB-Series], [WWB-Series] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. Communication: Wireless IEEE 802.15.4
3. Input power: Four (4) AAA standard alkaline batteries (WB-Series) or two (2) CR123A alkaline batteries (WWB-Series)
4. Shall provide individual button LED indication of status (WB-Series only) and wireless communication LED status.
5. Controls incorporate non-volatile memory. Settings and parameters saved in protected memory shall not be lost should power be interrupted and restored.
6. WaveLinx PRO Battery Powered Wallstation shall be FCC certified.
7. Wireless momentary pushbutton switches in 1, 2, 3, 5 and 6 button configurations; available in white; compatible with wall plates with decorator opening. WaveLinx PRO Battery Wallstations shall include the following features:
    a. Multi-level scene selection
    b. Scene raise/lower
    c. Toggle ON/OFF
    d. Intuitive button labelling to match application and load controls.
8. Multiple WaveLinx PRO wallstations may be installed in an area by simply connecting them to the WaveLinx PRO network. No additional configuration will be required to achieve multi-way switching.

9. WaveLinx PRO Battery Powered Wallstations are field programmable with specific labelling (FULL LIGHTS, HALF LIGHTS, etc.) or generic labelled buttons (Scene 1, Scene 2, etc.)
10. Optional custom labelling is available for application or location-specific wallstation button labels.

G. Wireless In-Fixture Indoor Sensor

1. Basis-of-design Product: WaveLinx PRO Integrated Sensor [WAA], [WPS] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. Communication: Wireless IEEE 802.15.4
3. Sensing mechanism:
    a. Infrared: Utilize multiple-segmented lens with internal grooves to eliminate dust and residue build-up.
    b. Photocell: Utilize integrated photocell to provide closed-loop daylight dimming control. Each WaveLinx PRO Integrated Sensor provides an individual daylight dimming zone to provide highly accurate daylight levels at the work surface throughout the entire space.
    c. Bluetooth radio: Utilize additional internal Bluetooth radio capable of offering Real-Time Location Services (RTLS) – IoT Software Upgrade Required
4. Power failure memory: Controls incorporate non-volatile memory. Settings and parameters saved in protected memory shall not be lost should power be interrupted and subsequently restored.
5. Products tested in identical manner, compliant to NEMA WD 7 -2011 Occupancy Motion Sensors Standards
6. Sensor shall have time delays from 10 to 20 min
7. Sensor shall provide unique daylight calibration considering the light level at the sensors, work surface and integrated luminaire light output.
8. All sensors shall provide an LED as a visual means of indication to verify that motion is being detected during both testing and normal operation
    a. Green LED indication when the sensor is in out-of-the-box operation mode
    b. White LED indication when the sensor has been connected to the WaveLinx lighting control system
9. Test mode - fifteen second time delay
10. Sensor shall provide out-of-the-box functionality of occupancy detection, directly controlling integrated fixture.
    a. The occupied default light level is 75%
    b. The unoccupied default light level is OFF
    c. The occupancy default time out is 20 minutes
11. Sensors shall monitor changes in occupancy changes in ambient light levels and communicate digital control commands to light fixtures according to a control strategy.
12. Sensor shall wirelessly transmit occupancy status and light level to the WaveLinx Area Controller, which allows the data to be stored in a central location on-premises and displayed via the WaveLinx Mobile Application and the WaveLinx CORE software applications.
13. Calculated energy consumption data available on the WaveLinx CORE
14. Sensors shall be fully adaptive with the ability to have the sensitivity and timing to be remotely adjusted to ensure optimal lighting control for any use of the space.
15. Sensors have remotely adjustable settings for dimming levels, occupied/unoccupied light levels, occupancy/vacancy sensing, and sensitivity to changes in motion and changes in ambient light levels.

16. Sensors may remotely adjust the light output to reduced levels and remain at that reduced level for an adjustable period before turning off when a space is vacant.
17. Default programming is stored in each sensor in addition to the WaveLinx Area Controller. Sensors operate independently from WaveLinx Area Controller, so single-point failure cannot be. Systems must operate so there is no single point of failure.
18. Standards/Environmental regulations:
    a. FCC certified
    b. cULus Listed
    c. RoHS

2.6 AREA HUB, AREA CONTROLLER, SUPERVISORY APPLIANCES

A. Wired Communication Bridge

1. Basis-of-Design Product: WaveLinx Area Hub [WAH-POE] or comparable product by one of the following:
2. Acuity Brands
    a. Legrand
3. An appliance that acts as gateway by converting the data received from eight areas to an area controller via ethernet.
4. Communication: low voltage network cable to the wired control devices and ethernet to the IP network switch.
5. Communication Ports: Nine (9) RJ-45 ports with 8 used to connect to 8 areas/spaces and one used to connect the communication bridge to an IP network switch and area controller.
6. Input power: Power over Ethernet (PoE – IEEE 802.3af) powered.

B. Area Controller

1. Basis-of-Design Product: WaveLinx Area Controller [WAC2-POE] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. An appliance that allows users to discover, program, and manage WaveLinx wired and wireless control devices and connected luminaires.
3. Communication:
    a. Wireless IEEE 802.15.4 to communicate with WaveLinx wireless devices.
    b. Wireless IEEE 802.11 a/b/g/n to communicate with mobile devices with compatible browser and/or WaveLinx Mobile Apps
    c. 1 x RJ45 to communicate with the area hub and supervisory appliance via ethernet.
4. Power source: standardized Power over Ethernet (IEEE802.3af) input, enables building PoE network switches (by others) or a PoE injector [WPOE2-120] (accessory by Cooper Lighting Solutions) for power and network connection.
5. Maximum Ethernet (CAT5 or better) cable distance between the WaveLinx Area Controller and a network PoE switch is 328 feet (100 meters). Care shall be taken when routing the cable not to exceed the 328 feet (100 meters) limitation, including travel distance up and down structures.
6. The Wi-Fi access point allows users to use the WaveLinx mobile app to program the system.
    a. The user shall be able to disable/enable the Wi-Fi access point.
7. 2.4 GHz Transceiver for IEEE 802.15.4 wireless radio to connect devices and sensors.
8. Shall support AES 128-bit encryption.

9. Shall use industry-standard HTTPS security with AES-128 encryption safeguards the entire system's integrity.
10. LED indicators for the status of various wireless radios and communications.
11. Shall be FCC Part 15 Class A, RoHS certified.
12. WaveLinx Area Controller connection cables shall be plenum rated.
13. Shall be Class 2 devices.
14. Shall have IEC62443-4-2 certification by a third-party IEC authorized lab. Self-certification will not be accepted.
15. Spaces defined within the WaveLinx area controller shall be equipped with a control device to shut off lighting in those areas automatically. This automatic control device shall function on either:
    a. A timeclock scheduling basis where the interior and exterior lights controlled by the WaveLinx Area Controller are changed based on the time of day or the astronomic (sunrise and sunset).
        1) The astronomical time clock shall be integrated into the WaveLinx Area Controller and shall not require any internet connection to maintain its time.
        2) After a power loss, the timeclock programming and time clock settings shall be retained.
        3) The time clock shall allow weekly recurrences.
        4) Time clock events can be scheduled to:
            a) Set areas to desired scenes.
            b) Zone light levels to the desired light level
            c) Zone light levels when occupied.
            d) Zone light levels when unoccupied
    b. An occupancy basis where the interior lights controlled by the WaveLinx Area Controller are changed based on the occupancy set status. The occupancy set is composed of one or more occupancy sensors, and it shall turn lighting off within 20 minutes of an occupant leaving a space.
    c. A manual command basis where a user or a program sends an override command using a wired or wireless wallstation, the mobile application, or BACnet/IP or Public API. The BACnet/IP and Public API signal will be received via the Insight Manager/supervisory system.
16. Shall allow users to backup the programming to prevent data loss and restore fixtures to operational modes.
17. Shall allow users to centrally manage other supervisory appliances (e.g. WaveLinx CORE) when moving through a job site.
18. Construction Grouping
    d. PAIR button to allow automatic creation of Construction Group allowing simplified automatic control of all connected devices and sensors.
    e. The patent-pending Construction Grouping mode permits contractors to complete a quick system start-up to confirm that the devices have been installed correctly instead of waiting for factory-trained technicians to get the lights on a project in working order. Contractors follow a straightforward process to pair the wireless devices with the appropriate WAC and initiate occupancy-based lighting control functionality. This saves lighting energy during the project's construction phase by ensuring that the lights are turned off when the area is unoccupied.
    f. Construction grouping visually indicates to the installer that devices have received wireless communication from the WaveLinx Area Controller and received a unique individual address. Systems that do not provide a visual indication of device connection status shall not be acceptable.
    g. Construction grouping provides an automatic grouping of connected devices to provide simple occupancy-based and wallstation control of all devices without requiring a factory-trained technician. Systems that require special software or training to group wireless devices shall not be acceptable.

19. Scalability and Data Integrity
    a. The WaveLinx Area Controller can be deployed as a dedicated installation managing up to 400 wired devices (devices connected using a CAT5 or higher cable).
    b. The WaveLinx Area Controller can be deployed as a dedicated installation managing up to 400 wired devicesWhen deployed as a dedicated installation, the WaveLinx Area Controller acts as a local wireless access point for the Wi-Fi connection method to the WaveLinx Mobile or Web-based Application.
    c. The WaveLinx Area Controller can be deployed as a network or hybrid installation managing up to 400 total devices with a maximum of 150 wireless devices (connected devices, connected sensors) per WaveLinx Area Controller. When deployed as a network installation, the WaveLinx Area Controller connects to the building LAN or wireless network as a client using DHCP. The maximum number of WaveLinx Area Controllers on the building network depends on the building network configuration.

C. Supervisory Appliance

1. Basis-of-Design Product: WaveLinx CORE [TRX-TCPRO2, TRX-TCENT2, TRX-TCVRT2] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. An appliance that allows users to manage a connected system remotely via a web browser or mobile app.
3. Communication:
    a. 2 x RJ45 to communicate with the area controllers via a network switch
4. Power source: low voltage power adapter for physical appliance versions.
5. Ability to connect to up to 300 WaveLinx Area Controllers. The entry-level model (WaveLinx CORE Pro) shall support up to 20 WaveLinx Area Controllers, while the enterprise-level model (WaveLinx CORE Enterprise) shall support up to 500 WaveLinx Area Controllers.
6. Shall be able to be hosted on a virtual VMWare appliance (TRX-TCVRT2)
7. Shall host all applications needed to manage the lighting system, analyze the data gathered by the sensors and locate assets/personnel.
8. No need to install a software application.
9. Shall hosts interfaces used to exchange data with third-party system: BACnet/IP, REST API and OpenADR (for Title24 compliance).
10. Shall have IEC62443-4-2 certified by an IEC authorized lab. Self-certification will not be accepted.
11. Ability to store 13 months of energy and occupancy data

2.7 SOFTWARE APPLICATIONS

D. Mobile Application (Wireless and Hybrid installation)

1. Basis-of-Design Product: WaveLinx Mobile Application [WAPP] or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. iOS and Android mobile application allowing users to program the areas being controlled by WaveLinx wired and wireless control devices.
3. The Mobile Application shall support the following features:
    a. Discovery of the control devices, connected luminaires, area hubs and area controller.

b. Blink identification of control devices, area hubs and connected luminaires by blinking them or devices connected to them.
c. Identified connected devices and sensors will indicate on the WaveLinx Mobile Application their selection by the device icon pulsing on the screen
d. Unique administrative login credentials for each area controller.
e. Discovery of wireless devices per area controller (Find Devices).
f. Creation of up to fifty (50) areas per area controller.
g. Ability to utilize drag and drop, multi-select and filter capabilities for the easy association of connected devices and sensors to a defined area.
h. Creation of up to sixteen (16) zones per area – up to 200 total zones per area controller.
i. Creation of up to six (6) occupancy sets per area – up to 100 total occupancy sets per area controller.
j. Creation of daylight sets per area.
k. Creation of Demand Response values for each area.
l. Definition of scene values for each area.
m. Definition of time-based events to turn the lights on/off for one or many areas.

4. Automatic Code Commissioning features include:

a. Automatic association of all devices added to an area to provide a California Title 24 code-compliant sequence of operations.
b. All occupancy sensors are joined together to provide an Automatic ON to 50% light level
c. All occupancy sensors are joined together to provide an Automatic OFF of all luminaires after 20 minutes with no occupancy detected.
d. Automatic closed-loop daylighting to approximately 500 lux (46 footcandles)
e. Automatic wallstation button mapping provides the dominant button providing a 50% light level all other buttons provide multi-level dimming control from 30%-100%
f. Automatic display of area power measurement data
g. Automatic Demand Response of 20%
h. Additional screens if needed to adjust Automatic Code Commissioning settings.

E. Web-Based enterprise software application (networked and hybrid installation)

1. Basis-of-Design Product: CORE lighting (TRX-LGT) or comparable product by one of the following:

a. Acuity Brands
b. Legrand

2. The application shall be offered as a mobile application running on Android and IOS devices as well as via HTML5 compatible web browsers such as Microsoft Edge, Google Chrome and Apple Safari.
3. The application shall support multiple computing device types, i.e. smartphones, tablets, laptops and desktop computers.
4. The software application shall be designed for touch interaction.
5. The application shall utilize HTTPS (industry-standard certificate-based encryption and authentication for security).
6. The system shall display the location of devices, zones and areas on a floor plan (jpeg or svg)
7. The system shall allow users to monitor and control the lights:

a. Area lights can be monitored for on/off status
b. Area lights can be modified to a pre-defined scene or defined light level
c. Zone lights can be monitored for on/off status
d. Zone lights can be modified to define the light level
e. Individual control devices can be monitored for on/off status
f. Individual control devices can be modified to define light levels or on/off status.

8. The system shall allow users to monitor and control the light schedules:
    a. Display the light schedule on a daily, weekly or monthly calendar
    b. Configure a light schedule based on a specific day or astronomic time clock event.
9. The system shall display the system's fault in near real-time. System faults include loss of communication with the WaveLinx Area Controller, wired wallstation, wired ceiling sensor, wired switchpack, wired daylight sensor, wired control module).
10. The system shall display the system's fault in near real-time. System faults include loss of communication with the WaveLinx Area Controller, wireless wallstation, wireless ceiling sensor, wireless switchpack, wireless daylight sensor, wireless control module and low battery alarms for battery powered devices (wireless wallstations and wireless ceiling sensors).
11. The system shall log all current and past system faults to provide better insight into the system's health.
12. The system shall offer context-sensitive troubleshooting tips for each alarm.
13. The system shall send e-mail notifications to subscribe users for each fault. The user shall provide the SMTP server information to allow the WaveLinx CORE to send out e-mail notifications.
14. The system shall display the energy usage for the buildings controlled by the WaveLinx system:
    a. The user shall filter the data based on the building hierarchy, i.e. building, floors, areas and zones, as well as the source type, i.e. lighting and/or receptacles.
    b. The system shall collect energy usage data for 13 consecutive months.
    c. The user shall change the period for the energy usage, i.e. last 24 hours, last 7 days, last 30 days, last 3 months, last 12 months.
    d. The user shall obtain the energy savings generated by the lighting system in kWh for the selected period.
    e. The user shall see the average energy savings for the selected period.
15. The system shall display the space for the buildings controlled by the WaveLinx system:
    a. The user shall filter the data based on the building hierarchy, i.e. building, floors, areas and zones.
    b. The system shall be able to collect space usage data for 13 consecutive months.
    c. The system shall display the space usage based on 24 hours or working hours.
    d. The system shall display in sorting order the least to most-used spaces.
    e. The system shall display the space usage for each area based on the selected period.

F. BACnet Interface (networked and hybrid installation)

1. Basis-of-Design Product: BACnet Interface (TRX-BACNET) or comparable product by one of the following:
    a. Acuity Brands
    b. Legrand
2. Allow a building automation system to gather data from the lighting system and control the light levels within different spaces.
3. The BACnet/IP interface shall support the following capabilities:
    a. Monitor (Read):
        1) Area scene
        2) Area energy usage
        3) Dimming zone level (0-100%)
        4) On/off zone level (on/off)
        5) Occupancy sensor's occupied/unoccupied status
        6) Daylight sensor's level
    b. Control (write):

1) System-wide Demand Response enable/disable
2) Building light level
3) Floor light level
4) Area scene
5) Dimming zone level (0-100%)
6) On/off zone level (on/off)
7) Occupancy sensor

4. The system shall allow users to select which object types the system shall expose, i.e. Area, Zones, input devices and output devices.
5. The system shall be able to generate the electronic PICS document and allow users to send the PICS document to the proper stakeholders.

G. API Interface (networked and hybrid installation)

1. Basis-of-Design Product: Public API (TRX-API) or comparable product by one of the following:

   a. Acuity Brands
   b. Legrand

2. The Public API allows third-party system to exchange data with the WaveLinx CORE appliance.
3. The Public API interface shall support the following get/put capabilities

   a. Get:
      1) Building hierarchy information (areas, zones, devices)
      2) Area scene
      3) Area energy usage
      4) Dimming zone level (0-100%)
      5) Zone level (on/off)
      6) Occupancy sensor's occupied/unoccupied status
      7) Occupancy set status
      8) Daylight sensor's level
   b. Put:
      1) System-wide Demand Response enable/disable.
      2) Area scene
      3) Dimming zone level (0-100%)
      4) Zone level (on/off)
      5) Occupancy sensor

H. OpenADR Interface (networked and hybrid installation)

1. Basis-of-Design Product: OpenADR interface (TRX-OPNADR) or comparable product by one of the following:

   a. Acuity Brands
   b. Legrand

2. The interface shall allow users to connect their lighting system with utility companies' Demand Response Automation Server (DRAS) using OpenADR 2.0b standard.
3. Initiate load shed event using OpenADR protocol in an auto-Demand-Response event without additional interfaces or gateways.

I. Real-Time Location Services (networked and hybrid installation)

4. Basis-of-Design Product: CORE Locate (TRX-LOCBAS) or comparable product by one of the following:

   a. Acuity Brands
   b. Legrand

5. The application shall enable users to enable real-time location services on the sensors.

6. The application shall allow users to assign Bluetooth Low Energy tags to assets or people.
7. The application shall allow users to track equipment and locate people in real-time in a floor plan view and table view with "room-level accuracy."
8. The application shall not require any access to public network or manufacturer cloud to work.
9. The application shall allow users to search and filter for a particular asset they are looking for using the parameters defined.
10. The application shall allow users to review the historical movement of an asset or a person in floor plan view.
11. The application shall provide location data through Application Programming Interface (API)

J. Space Utilization Application (networked and hybrid installation)

1. Basis-of-Design Product: CORE Insights (TRX-INSOCC) or comparable product by one of the following:
   a. Acuity Brands
   b. Legrand
2. The CORE Insights is a space analytics software application that allows users to monitor, compare and analyze their space usage to transform the occupancy data gathered by WaveLinx CORE/WaveLinx smart devices and occupancy sensors in ways that provide a deeper understanding of building space utilization and unlock optimization opportunities.
3. This application stores 13 months of Occupancy data
4. This application shall enable users to view key space performance indicators like avg occupancy %, # empty space vs total space, # of buildings, floors, sensors.
5. This application shall allow users to access the Occupancy dashboard to monitor space occupancy across the enterprise - sites/buildings/floor/etc.
6. This application shall allow users to quickly navigate from Enterprise level to Site, Area and Room level – Desktop, Mobile and Kiosk compatible views.
7. This application shall enable users to view occupancy information on the floor plan in real-time.
8. This application provides users with an intuitive chart view with space trending – bar/line chart, reports.
9. The application shall provide Occupancy data through Application Programming Interface (API)

PART 3 - EXECUTION

3.1 INSTALLATION

A. The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits.

B. Install the work of this Section in accordance with the manufacturer's printed instructions unless otherwise indicated.

C. Provide written or computer-generated documentation on the commissioning of the system, including room by room description including:

D. Sensor parameters, time delays, sensitivities, and daylighting setpoints.

E. A sequence of operations, (e.g., manual ON, Auto OFF. Etc.).

F. Load parameters (e.g., blink warning, etc.).

3.2 PRODUCT SUPPORT AND SERVICE

A. Factory telephone support shall be available at no cost to the owner. Factory assistance shall solve programming or application questions concerning the control equipment

3.3 FACTORY COMMISSIONING (OPTIONAL)

A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative, who will verify a complete, fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with twenty-one (21) working days' written notice of the system start-up and adjustment date.

C. Upon completion of the system commissioning, the factory-authorized technician shall provide the proper training to the owner's personnel on the system's adjustment and maintenance.

D. Qualifications for factory certified field service engineer:

E. Certified by the equipment manufacturer on the system installed.

F. Make the first visit upon completion of the installation of the WaveLinx Connected Lighting system:

G. Verify locations of WaveLinx Area Controllers

H. Verify implementation of Construction Group process

I. Identify connected devices and programs using WaveLinx Mobile Application and Automatic Code Commissioning.

J. Verify that system operation control is based on the defined Sequence of Operations (SOO).

K. Obtain sign-off on system functions.

L. Make a second visit (optional) to demonstrate and educate the owner's representative on system capabilities, programming, fine-tuning and maintenance.

M. Due to building operations, the start-up of the WaveLinx Connected Lighting system may be required outside of normal business hours (Monday through Friday, 7 a.m. to 5 p.m.).

3.4 CLOSEOUT ACTIVITIES (OPTIONAL)

A. Training Visit

1. Lighting control system manufacturer to provide one (1) day of additional on-site system training to site personnel. This shall be a part of the second visit by field service to the site. A separate third visit will require an additional charge.

B. On-site Walk-through

1. For LEED projects, the manufacturer shall conduct an on-site walk-through to demonstrate system functionality to a Commissioning Agent.
2. During this visit, the manufacturer's Field Service Engineer will perform tasks at the request of the facility representative or Commissioning Agent, such as demonstrating wall control functions explain or describing occupancy and/or daylight sensor functionality.
3. Lighting control system manufacturer to provide a factory-certified Field Service Engineer to demonstrate system functionality to the Commissioning Agent.

3.5 MAINTENANCE

A. Capable of providing on-site service support within 48 hours anywhere in the continental United States and within 72 hours worldwide except where special visas are required.

B. Offer renewable service contract on a yearly basis, including parts, factory labor, and annual training visits. Make service contracts available up to ten (10) years after the date of system start-up. Additional service contracts and warranties need to be verified as being available.

C. Prior to bid, confirm if an on-site meeting between the Lighting Control System Manufacturer and a Facility Representative will be required to evaluate system usage after the building has been in operation for a predetermined period. If a field service visit is required for Acceptance Testing or building commissioning, then it shall be as an additional service charge unless specifically stated in the specification and confirmed on the WaveLinx Connected Lighting bill of materials.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lighting and appliance panelboards.

B. Overcurrent protective devices for panelboards.

1.02 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision D.

B. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association.

G. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.

H. NFPA 70 - National Electrical Code; National Fire Protection Association.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

B. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

C. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify ENGINEER of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General Electric Company: www.geindustrial.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us. BASE BID Square D, other approved manufacturers may only be bid as a voluntary alternate to the base bid and must be clarified in the bid as such.

C. Siemens.

2.02 ALL PANELBOARDS

A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature:
   a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating: Refer to plans – Contractor shall verify AIC with local utility prior to ordering panelboards.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for

each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Aluminum.

a. Provide double neutral bus where scheduled.

3. Ground Bus Material: Aluminum.

a. Provide insulated ground bus where scheduled.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Provide clear plastic circuit directory holder mounted on inside of door.

F. Manufacturers:

1. Square D NQ or NF type. BASE BID SQUARE D.

2. Equal by approved manufacturer may be bid as alternate.

G. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

H. Minimum Integrated Short Circuit Rating: As indicated on drawings or minimum as listed below.

1. 208/240 Volt Panelboards: 14,000 amperes rms symmetrical.

2. 480/277 Volt Panelboards: 22,000 amperes rms symmetrical.

I. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.

1. Type SWD for lighting circuits.
2. Type HACR for air conditioning equipment circuits.
3. Class A ground fault interrupter circuit breakers where scheduled.
4. Do not use tandem circuit breakers.
5. Lock-on devices shall be provided for all branch circuits supplying exit lighting, un-switched night lighting, emergency lighting, security systems, and/or fire alarm.

J. Enclosure: NEMA PB 1, Type 1. (Type 3R for exterior locations).

K. Cabinet Front: Flush or Surface (as noted on plans) cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 0529.

E. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

F. Provide grounding and bonding in accordance with Section 26 0526.

G. Install all field-installed branch devices, components, and accessories.

H. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

I. Height: 6 feet (1800 mm) to top of panelboard; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.

J. Provide filler plates to cover unused spaces in panelboards.

K. Provide computer-generated circuit directory for each lighting and appliance panelboard, and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

L. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

M. Provide identification nameplate for each panelboard in accordance with Section 26 0553.

N. Provide arc flash warning labels in accordance with NFPA 70.

O. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling/ in crawl space/to j-box/etc. for future use. Identify each as SPARE.

1. Minimum spare conduits: 5 empty 1 inch (DN27). Spare conduits shall be stubbed up into an accessible ceiling space, or floor below.

3.02 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 01 4000.

B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA STD ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 400 amperes. Tests listed as optional are not required.

C. Correct deficiencies and replace damaged or defective panelboards or associated components.

D. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

3.03 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

END OF SECTION

SECTION 26 2717

EQUIPMENT WIRING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association.

B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association.

C. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.04 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Conform to NEMA WD 1.
2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 2818, 26 2913 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 2726.

D. Flexible Conduit: As specified in Section 26 0534.

E. Wire and Cable: As specified in Section 26 0519.

F. Boxes: As specified in Section 26 0537.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations. Maximum length shall be 6 feet. Minimum size shall be 3/4" diameter.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

1.02 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F.

C. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association.

E. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association.

F. NFPA 70 - National Electrical Code; National Fire Protection Association.

G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Wiring Devices: www.cooperwiringdevices.com.

B. Leviton Manufacturing, Inc.: www.leviton.com.

C. Hubbell.

D. Bryant.

2.02 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 WALL SWITCHES

A. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and

where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Wall Switches: NEMA WD 1, General Duty, Spec. Grade, AC only general-use snap switch. Switches shall be binding screw type, side and back wired type.

1. Body and Handle: Ivory plastic with toggle handle. Coordinate color selection with Architect prior to ordering.
2. Ratings: Match branch circuit and load characteristics.

C. Single Pole Single Throw Wall Switches

1. Products:
   a. Hubbell 1221.
   b. Arrow Hart 1991.
   c. Leviton 1221.

D. Three Way Wall Switches

1. Products:
   a. Hubbell 1223.
   b. Arrow Hart 1993.
   c. Leviton 1223.

2.04 RECEPTACLES

A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

B. Receptacles: NEMA WD 1, General duty, Spec. Grade, grounded type

1. Configuration: NEMA WD 6, type as specified and indicated.

C. 20 Amp Duplex Convenience Receptacles.

1. Hubbell 5362.
2. Arrow Hart 5362.
3. Leviton 5362.
4. Device Body: Ivory; Coordinate color selection with Architect prior to ordering.
   a. All devices on emergency circuits shall be red in color.
5. NOTE: All receptacles in commercial buildings/areas with children use (i.e. schools, daycare facilities, classrooms, librarys, etc.) and health clinic exam rooms shall be "Tamper Resistant" (TR) rated, commercial grade.

D. 20 Amp GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

1. Hubbell.
2. Arrow Hart.
3. Leviton.

4. Device Body: Ivory. Coordinate color selection with Architect prior to ordering.
    a. All devices on emergency circuits shall be red in color.
5. GFCI receptacles shall meet UL 2003 standards.
6. NOTE: All receptacles in commercial buildings/areas with children use (i.e. schools, daycare facilities, classrooms, librarys, etc.) and health clinic exam rooms shall be "Tamper Resistant" (TR) rated, commercial grade.

E. 20 Amp Isolated Ground Receptacles.

1. Hubbell IG 5362.
2. Arrow Hart IG 5362.
3. Leviton 5362-IG.
4. Device Body: Orange, coordinate color selection with Architect prior to ordering.
    a. All devices on emergency circuits shall be red in color.
5. NOTE: All receptacles in commercial buildings/areas with children use (i.e. schools, daycare facilities, classrooms, librarys, etc.) and health clinic exam rooms shall be "Tamper Resistant" (TR) rated, commercial grade.

2.05 WALL PLATES

A. All Wall Plates: Comply with UL 514D.

1. Configuration: One-piece cover as required for quantity and types of corresponding wiring devices.
2. Screws: Metal with slotted heads finished to match wall plate finish.

B. Interior wall plates:

1. Stainless Steel Cover Plates:
    a. Hubbell "S" series.
    b. Leviton 8400 series.
    c. Arrow Hart "S" series.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

G. Verify door openings/swings with Architectural trades prior to installation.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of wiring devices provided under this section.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Install wiring devices plumb and level with mounting yoke held rigidly in place.

I. Install wall switches with OFF position down.

J. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

K. Do not share neutral conductor on branch circuits utilizing wall dimmers.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

O. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

P. Use jumbo size plates for outlets installed in masonry walls.

Q. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 0537 to obtain mounting heights indicated on drawings.

B. Install wall switches, dimmers, motor control switches, and fire alarm pull stations at 50 inches to center of box above finished floor. For CMU walls - 48" to top of box above finished floor.

C. Install convenience receptacles 18 inches (450 mm) above finished floor to center of box (not otherwise specified).

D. Install convenience and special purpose receptacle outlets in CLASS 1 locations at 24" above the floor to bottom of box.

E. Install convenience receptacles in CMU walls at 16 inches above floor to bottom of box.

F. Unless noted otherwise, install GFI receptacles in toilet rooms, janitor closets, and storage rooms 48 inches to top of the box above floor.

G. Install convenience receptacles 6 inches (150 mm) above counter. Or as required to accommodate the counter construction - refer to Architectural elevations.

H. Install telephone jacks, data outlets, communication outlets, etc. 18 inches (450 mm) to center of box above finished floor. For CMU walls - 16" to bottom of box above finished floor.

I. Install fire alarm horns, strobes, speakers at 96 inches above floor (to top of box) or 6 inches below ceiling, whichever is less. But no lower than 80" above finish floor.

J. Coordinate all finishes and colors of wiring devices with Architect prior to ordering.

K. Coordinate mounting height/locations with Architect prior to rough-in.

3.05 FIELD QUALITY CONTROL

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

C. Test each receptacle to verify operation and proper polarity.

D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association.

B. NFPA 70 - National Electrical Code; National Fire Protection Association.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

1.03 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.04 MAINTENANCE MATERIALS

A. Furnish three of each size and type fuse installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Bussmann, Inc.: www.cooperbussmann.com.

B. GE Industrial: www.geindustrial.com.

C. Mersen (formerly Ferraz Shawmut): ferrazshawmut.mersen.com.

D. Littelfuse, Inc.: www.littelfuse.com.

2.02 FUSES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Main Service Switches Larger than 600 amperes: Class L (time delay).

H. Main Service Switches: Class RK1 (time delay).

I. Power Load Feeder Switches Larger than 600 amperes: Class L (time delay).

J. Power Load Feeder Switches: Class RK1 (time delay).

K. Motor Load Feeder Switches: Class RK1 (time delay).

L. Other Feeder Switches Larger than 600 amperes: L time delay.

M. Other Feeder Switches: Class RK1 (time delay).

N. General Purpose Branch Circuits: Class RK1 (time delay).

O. Motor Branch Circuits: Class L time delay.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26 2818

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fusible switches.

B. Non-Fusible switches.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

B. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association.

C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association.

D. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.03 SUBMITTALS

A. Project Record Documents: Record actual locations of enclosed switches.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General Electric Company: www.geindustrial.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us. BASE BID Square D, other approved manufacturers may only be bid as a voluntary alternate to the base bid and must be clarified in the bid as such.

C. Siemens.

2.02 COMPONENTS

A. Fusible Switch Assemblies: 30 thru 600A, NEMA KS 1, Type HD quick-make, quick-break, enclosed load interrupter knife switch.

1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle lockable in OFF position.
3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

B. Non-Fusible Switch Assemblies: NEMA KS 1, Type HD quick-make, quick-break, enclosed load interrupter knife switch.

1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1.

1. Interior Dry Locations: Type 1.

2. Exterior Locations: Type 3R or 4x.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed switches in accordance with manufacturer's instructions.

B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Provide identification nameplate for each enclosed switch in accordance with Section 26 0553.

I. Provide arc flash warning labels in accordance with NFPA 70.

J. Install fuses in fusible disconnect switches.

K. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

END OF SECTION

SECTION 26 5100

INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

B. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association.

C. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association.

D. NFPA 70 - National Electrical Code; National Fire Protection Association.

E. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association.

F. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

1.06 SUBSTITUTION ITEMS REQUIRING PRIOR APPROVAL

A. All items that the CONTRACTOR proposes to use in the work, that are not specifically named in the contract documents, must be submitted for review/approval. Such items must be submitted in duplicate to the ARCHITECT and/or ENGINEER for approval a minimum of ten (10) days prior to bid opening. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.

B. Lighting Substitutions:

1. Furnish lighting fixtures as scheduled on drawings.
2. Lighting fixture substitutions may be considered for approval by the ARCHITECT/ENGINEER only if all of the following criteria are met:
   a. Provide specification cut sheets marked-up to clearly identify the proposed luminaire including features, options, accessories, etc. required to match products indicated in the schedules.
   b. Provide detailed point-by-point lighting calculations for all areas proposed luminaire will be installed.
   c. Submit all cut sheets, calculations, etc. to the ARCHITECT/ENGINEER no less than 10 days prior to bid date. Substitutions submitted after this date will not be considered.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acuity/Lithonia Lighting.

B. Eaton/Cooper Lighting.

C. Hubbell Lighting.

D. Or as noted in lighting schedule on the drawings.

2.02 LUMINAIRES

A. Provide products that are listed and labeled as complying with UL 1598, where applicable.

B. Provide products that comply with requirements of NFPA 70 and NFPA 101.

C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. Unless otherwise indicated, provide complete luminaires including LED light source, lamp(s) and all sockets, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings.

2.05 LAMPS

A. All LED light sources or Lamps:

1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the ENGINEER to be inconsistent in perceived color temperature.

B. Lamp Types: As specified for each fixture.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Install suspended luminaires using pendants supported from swivel hangers (except where noted to use chain hangers). Provide pendant length required to suspend luminaire at indicated height.

F. Support luminaires independent of ceiling framing.

G. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

H. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

I. Install recessed luminaires to permit removal from below.

J. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

K. Install wall mounted luminaires at height as indicated on Drawings or in Architectural plans.

L. Install accessories furnished with each luminaire.

M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

N. Connect luminaires to branch circuit outlets provided under Section 26 0537 using flexible conduit.

O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

P. Bond products and metal accessories to branch circuit equipment grounding conductor.

Q. All night lights, emergency lights, and exit signs shall be circuited from the unswitched hot leg of the general lighting circuit for the area served by the night/emergency/exit lights.

3.02 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

3.03 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by ENGINEER. Secure locking fittings in place.

B. Aim and adjust fixtures as indicated.

3.04 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.05 SCHEDULE - See Drawings

END OF SECTION

SECTION 28 3100

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

C. Maintenance of fire alarm system under contract for specified warranty period.

D. The Owner (Kevin Beeson @ Midland County) will direct hire the Fire Alarm work for this project to Veteran's Alarm (contact Kelly or Don @ 989-631-1111).

1. Electrical Contractor (E.C.) shall coordinate any/all rough-ins (boxes, conduit, etc.), and any 120V wiring, needed for this project with the Owner's Fire Alarm subcontractor (F.A.) = Veteran's Alarm (contact Kelly or Don @ 989-631-1111).

1.02 REFERENCE STANDARDS

A. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

B. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits.

C. NFPA 70 - National Electrical Code.

D. NFPA 72 - National Fire Alarm Code and Signaling Code.

E. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.

F. Applicable Building Code.

1.03 SUBMITTALS

A. Drawings shall be prepared as .DWG / .DXF-format CAD drawings.

1. OWNER/Architect/Engineer will provide floor plan drawings in.DWG / .DXF-format CAD for CONTRACTOR's use; verify all dimensions on OWNER-provided drawings.

B. Evidence of designer qualifications, if requested.

C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:

1. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.

2. System zone boundaries and interfaces to fire safety systems.

3. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.

4. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.

5. List of all devices on each signaling line circuit, with spare capacity indicated.

6. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

7. Description of power supplies; if secondary power is by battery include calculations

demonstrating adequate battery power.

8. Do not show existing components to be removed.
9. NFPA 72 "Record of Completion", filled out to the extent known at the time.

D. Inspection and Test Reports:

1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

E. Operating and Maintenance Data: Revise and resubmit until acceptable; have one set available during closeout demonstration:

1. Original copy of NFPA 72 with portions that are not relevant to this project neatly crossed out by hand; label with project name and date.
2. Complete set of specified design documents, as approved by authority having jurisdiction.
3. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
4. Contact information for firm that will be providing contract maintenance and trouble call-back service.
5. List of recommended spare parts, tools, and instruments for testing.
6. Replacement parts list with current prices, and source of supply.
7. Detailed troubleshooting guide and large scale input/output matrix.
8. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to OWNER.
9. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

F. Project Record Documents: Have one set available during closeout demonstration:

1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

G. Closeout Documents:

1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
3. Certificate of Occupancy.
4. Maintenance contract.

1.04 QUALITY ASSURANCE

A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to OWNER upon completion.

B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, CONTRACTOR, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

C. Installer Qualifications: Firm with minimum 5 YEARS documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.

2. Installer Personnel: At least 3 YEARS of experience installing fire alarm systems.

3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

4. Contract maintenance office located within 100 miles of project site.

5. Certified in as fire alarm installer.

D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

E. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.05 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

1.06 GENERAL REQUIREMENTS

A. Refer to 260001 - General Electrical Requirements for general requirements of this specification section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units - Acceptable Manufacturers: Provided their products meet or exceed the performance of the basis of design product, products of the following are acceptable:

1. The existing building (Midland County Services Building) currently has an existing Fire Alarm system and an existing Fire Alarm Control Panel (FACP) Unit – The existing Make / Model # and location of the FACP is unknown and shall be field verified/confirmed by the Fire Alarm Subcontractor prior to bid/rough-in.

a. Any new Fire Alarm controllers, NAC panel, power supplies, devices, etc…shall be compatible with the existing FACP & existing Fire Alarm system.

B. Initiating Devices, and Notification Appliances:

1. Same manufacturer as control units.

2. Provide all initiating devices and notification appliances made by the same manufacturer.

2.02 FIRE ALARM SYSTEM

A. Design & Build Fire Alarm System: Fire Alarm subcontractor (F.A.) shall provide Design & Build of a renovated automatic fire detection and alarm system as needed for this project:

1. Provide design and installation of all components/wiring/conduit/etc. necessary to provide a complete/functional system per NFPA 72. The contract documents are diagrammatical in nature and should not be used or bid as detailed design drawings. The fire alarm contractor shall provide any/all design and construction required for the entire fire alarm system and bid the project as such.
2. Protected Premises:
    a. Work areas as shown on drawings.
        1) Midland County Services Building
            a) 1st Floor renovations.
            b) 2nd Floor renovations.
            c) 3rd Floor renovations.
    b. Supervise & Alarm existing Fire Suppression Sprinkler system, coordinate requirements with Fire Suppression Sprinkler system subcontractor.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    a. The Americans With Disabilities Act (ADA).
    b. The requirements of the State Fire Marshal.
    c. The requirements of the local authority having jurisdiction.
    d. Applicable local codes.
    e. The contract documents (drawings and specifications).
    f. NFPA 101.
    g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
    h. Local Fire Department/Authority requirements.
4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
6. Program notification zones and voice messages as directed by OWNER.
7. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
8. Fire Alarm Master Control Unit (FACP): EXISTING, to revised/extended as required for this renovation project.
    a. The existing building has an existing Fire Alarm system and an existing Fire Alarm Control Panel (FACP) Unit – The existing Make / Model # and location of the FACP is unknown and shall be field verified/confirmed by the Fire Alarm Subcontractor prior to bid/rough-in.
9. The fire alarm designer/installer shall visit the site to familiarize himself with the project's existing conditions and determine the full extent and character of his work.

B. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style C.

2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 4.
3. Notification Appliance Circuits (NAC): Class B, Style Y.
4. All circuits shall be installed in conduit.

C. Spare Capacity:

1. Initiating Device Circuits: Minimum 25 percent spare capacity.
2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
3. Speaker Amplifiers: Minimum 25 percent spare capacity.
4. Fire Alarm Master Control Unit (FACP): Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

D. Power Sources:

1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 EXISTING COMPONENTS

A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.

B. On-Premises Supervising Station: Include as part of this work all modifications necessary to existing supervising station to accommodate new fire alarm work.

C. Clearly label components that are "Not In Service."

D. Remove unused existing components and materials from site and dispose of properly.

2.04 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:

1. Wet pipe Fire Suppression sprinkler water control valves, flow switches, etc..
2. Clean Agent (Novec 1230) Fire Protection Extinguish systems.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:

1. Sprinkler water flow.
2. Duct smoke detectors.

C. HVAC:

1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

D. Doors:

1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.
2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from.
3. Overhead Coiling Fire Doors: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler

activation on same floor.

2.05 COMPONENTS

A. General:

1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.

   a. Provide matching shrouds to cover sides of new devices that are installed on surface mounted J-boxes.

2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

3. Drawings are diagrammatic and indicate the general scope of work. Provide design and installation of all initiating devices, notification appliances, circuits, etc. required for a complete/functional system per NFPA 72, Life Safety Code, and applicable building codes, whether accurately shown on the drawings or not.

B. Fire Alarm Master Control Unit (FACP), Initiating Devices, and Notification Appliances: Addressable Type; listed by Underwriters Laboratories as suitable for the purpose intended.

C. Initiating Devices:

1. Manual Pull Stations.

2. Smoke Detectors.

3. Duct Smoke Detectors.

4. Heat Detectors.

5. Addressable Interface Devices.

D. Notification Appliances:

1. Horn/Strobes or Speaker/Strobes: All horn/strobes & speaker/strobes shall have field adjustable candela options of 15, 30, 75, 95, and 110 candela.

2. Strobes: All strobes shall have field adjustable candela options of 15, 30, 75, 95, and 110 candela.

E. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.

F. Provide protective guards for all notification appliances and initiating devices located in high abuse areas (i.e. gymnasiums, locker rooms, mechanical rooms, etc.).

G. Provide weatherproof devices in wet/damp locations (i.e. outdoors, shower rooms, locker rooms, pool/spa areas, etc.)

H. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.

I. Locks and Keys: Deliver keys to OWNER.

1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

J. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.

1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

2. Provide one for each control unit where operations are to be performed.
3. Obtain approval of OWNER prior to mounting; mount in location acceptable to OWNER.
4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain OWNER's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify OWNER 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated OWNER personnel:

1. Hands-On Instruction: On-site, using operational system.

B. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:

1. Initial Training: 1 session pre-closeout.
2. Refresher Training: 1 session post-occupancy.

C. Maintenance Technicians: Detailed training for electrical technicians, on programming, maintaining, repairing, and modifying; factory training:

1. Initial Training: One 1-day session, pre-closeout.
2. Refresher Training: One 1-day session post-occupancy.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to OWNER.

1. Be prepared to conduct any of the required tests.
2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during

demonstration.

3. Have authorized technical representative of control unit manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
5. Repeat demonstration until successful.

B. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:

1. Approved operating and maintenance data has been delivered.
2. All aspects of operation have been demonstrated to OWNER.
3. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
4. Occupancy permit has been granted.
5. Specified pre-closeout instruction is complete.

C. Perform post-occupancy instruction within 3 months after Substantial Completion.

3.05 MAINTENANCE

A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide to OWNER, maintenance service for 1 year, to include the work described below.

C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:

1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D. Provide trouble call-back service upon notification by OWNER:

1. Provide on-site response within 8 hours of notification.
2. Include allowance for call-back service during normal working hours at no extra cost to OWNER.
3. OWNER will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to OWNER's representative upon completion of site visit.

G. Comply with OWNER's requirements for access to facility and security.

END OF SECTION